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October 1970

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**SOLID
STATE**

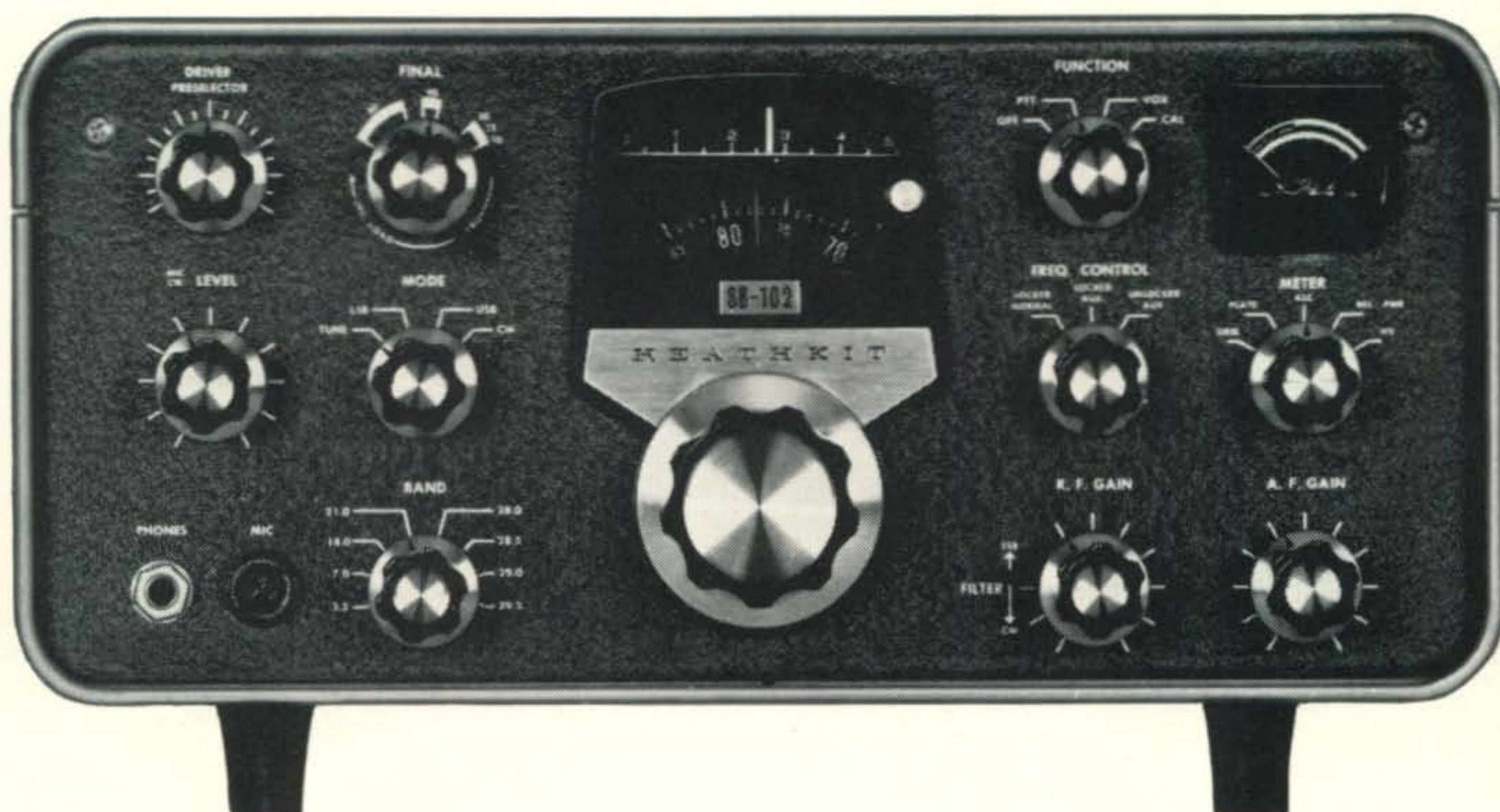
PERMEABILITY TUNED V.F.O.

AUDIO TEST OSCILLATOR

CQ & M.S. DATA GENERATOR

**ALL TIME RECORDS
CQ WW DX CONTEST**

The Radio Amateur's Journal



Want to start a pile-up?

The New Heathkit® SB-102

Direct descendent of the most popular sideband rigs ever produced — the famous "100" & "101" Series. With an ancestry of top performance, high reliability and unbeatable value, you expect the new "102" to be a better rig . . . and it is.

The frequency stability and linearity of the "101" were second to none. The "102" is even better. An all solid-state Linear Master Oscillator cuts stabilization time in half; offers far greater tracking accuracy.

Hot new receiver circuitry delivers improved sensitivity . . . now less than 0.35 μ V for 10 dB signal plus noise to noise. This increase gives you solid copy longer when the band is on the way out.

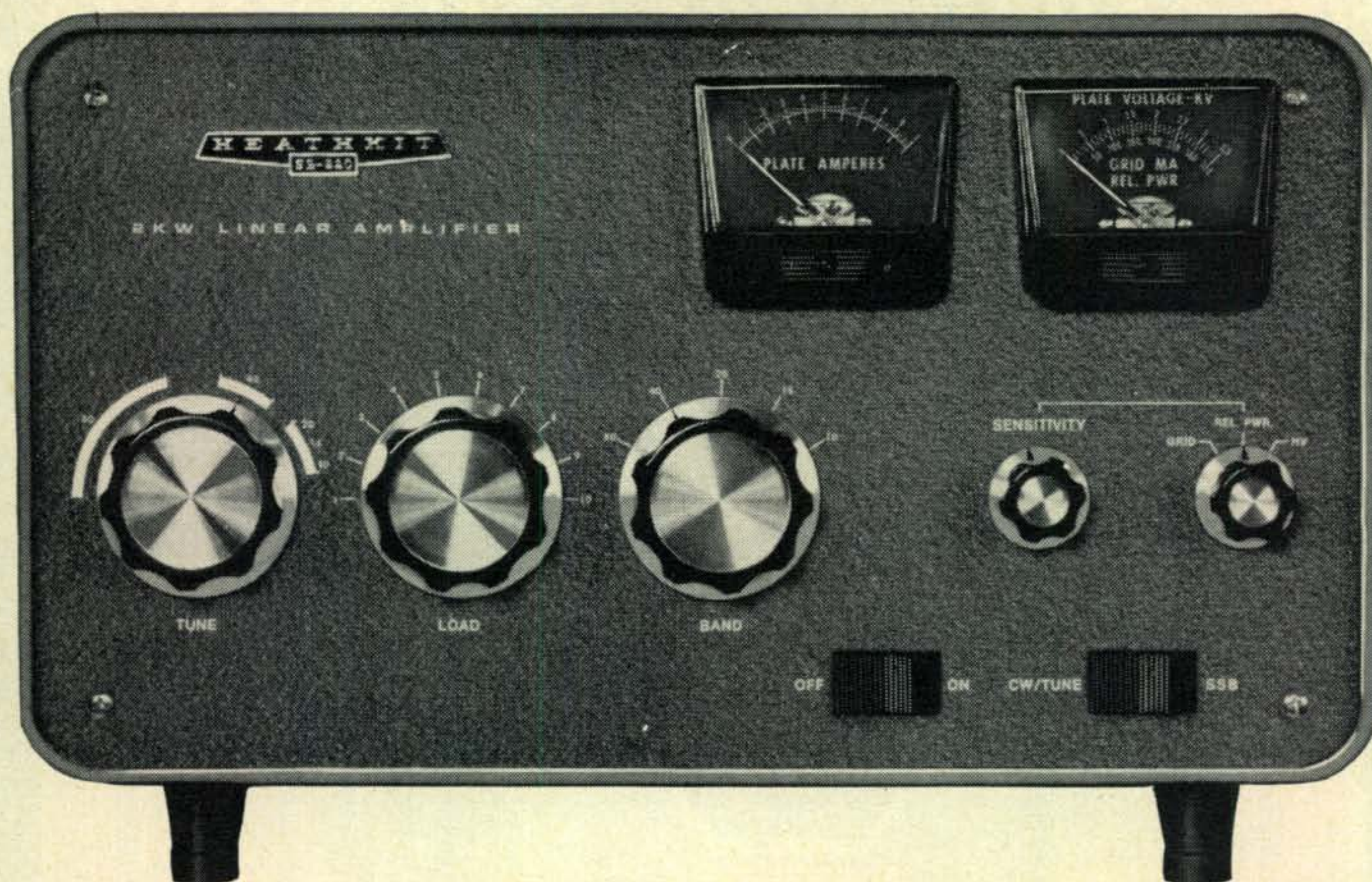
The new "102" brings you all the flexibility and performance that made the "101" the standard of comparison on the air, plus important new features. Start your Maxi-Rig now . . . with the SB-102 — from the Hams at Heath, of course.

SB-102 SPECIFICATIONS — RECEIVER SECTION: Sensitivity: Better than 0.35 microvolt for 10 dB signal-plus-noise to noise ratio for SSB operation. **SSB selectivity:** 2.1 kHz minimum at 6 dB down, 5 kHz maximum at 60 dB down — 2:1 nominal shape factor — 6:60 dB. **CW Selectivity:** (With optional CW filter SBA-301-2 installed) 400 Hz minimum at 6 dB down, 2.0 kHz maximum at 60 dB down. **Input impedance:** Low impedance for unbalanced coaxial input. **Output impedance:** Unbalanced 8 and 600 ohm speaker, and high impedance headphone. **Power output:** 2 watts with less than 10% distortion. **Spurious response:** Image and IF rejection better than 50 dB. Internal spurious signals below equivalent antenna input of 1 microvolt. **TRANSMITTER SECTION:** **DC power input:** SSB: 180 watts P.E.P. continuous voice. CW: 170 watts — 50% duty cycle. **RF power output:** 100 watts on 80 through 15 meters; 80 watts on 10 meters (50 ohm non-reactive load). **Output impedance:** 50 ohms to 75 ohms with less than 2:1 SWR. **Oscillator feedthrough or mixer products:** 55 dB below rated output. **Harmonic radiation:** 45 dB below rated output. **Transmit-receive operation:** SSB: Push-to-talk or VOX. CW: Provided by operating VOX from a keyed tone, using grid-block keying. **CW side-tone:** Internally switched to speaker in CW mode. Approx. 1000 Hz tone. **Microphone input impedance:** High impedance. **Carrier suppression:** 50 dB down from single-tone output. **Unwanted sideband suppression:** 55 dB down from single-tone output at 1000 Hz reference. **Third order distortion:** 30 dB down from two-tone output. **Noise level:** At least 40 dB below single-tone carrier. **RF compression**

• New all solid-state Linear Master Oscillator features 1 kHz dial calibration • Bandsread equal to 10 feet per Megahertz • Less than 100 Hz per hour drift after 10 minute warm up • Dial resettable to 200 Hz • New receiver circuitry provides sensitivity of better than 0.35 μ V for 10 dB S+N/N • 180 watts PEP SSB input — 170 watts CW input • 80 through 10 meter coverage • Switch-selection of USB, LSB or CW • Built-in CW sidetone • Built-in 100 kHz crystal calibrator • Triple Action Level Control™ reduces clipping and distortion • Front panel switch selection of built-in 2.1 kHz SSB or optional 400 Hz CW crystal filters • Operate with built-in VOX or PTT • Fast, easy circuit board-wiring harness construction • Run fixed or mobile with appropriate low cost power supplies

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 HP-23A, AC Power Supply, 19 lbs. \$51.95*
 HP-13A, DC Power Supply, 7 lbs. \$69.95*
 SBA-301-2, 400 Hz CW Crystal Filter, 1 lb. \$21.95*
 SBA-100-1, Mobile Mounting Kit, 6 lbs. \$14.95*

(TALC): 10 dB or greater at .1 ma final grid current. **GENERAL:** **Frequency coverage:** 3.5 to 4.0; 7.0 to 7.3; 14.0 to 14.5; 21.0 to 21.5; 28.0 to 28.5; 28.5 to 29.0; 29.0 to 29.5; 29.5 to 30.0 (megahertz). **Frequency stability:** Less than 100 Hz per hour after 10 minutes warm-up from normal ambient conditions. Less than 100 Hz for $\pm 10\%$ line voltage variations. **Modes of operation:** Selectable upper or lower sideband (suppressed carrier) and CW. **Visual Dial Accuracy — "resetability":** Within 200 Hz on all bands. **Electrical dial accuracy:** Within 400 Hz after calibration at nearest 100 kHz point. **Dial mechanism backlash:** Less than 50 Hz. **Calibration:** 100 kHz crystal. **Audio frequency response:** 350 to 2450 Hz ± 3 dB. **Phone patch impedance:** 8 ohm receiver output to phone patch; high impedance phone patch input to transmitter. **Front panel controls:** Main (LMO) tuning dial; Driver tuning and Preselector; Final tuning; Final loading; Mic and CW Level Control; Mode switch; Band switch; Function switch; Freq. Control switch; Meter switch; RF gain control; SSB-CW filter switch. Audio Gain control. **Internal controls:** VOX Sensitivity; VOX Delay; Anti-Trip; Carrier Null (control and capacitor); Meter Zero control; CW Side-Tone Gain control; Relative Power Meter Adjust control; P.A. — Bias; Phone Vol (headphone volume); Neutralizing. **Rear Apron Connections:** CW Key jack; 8 ohm output; Spare A; Spare B; Phone patch input; ALC input; Power and accessory plug; RF output; Antenna switch; Receiver Antenna. **Power requirements:** 700 to 800 volts at 250 ma; 300 volts at 150 ma; —115 volts at 10 ma; 12 volts at 4.76 amps. **Cabinet dimensions:** 14 $\frac{7}{8}$ " W x 6 $\frac{5}{8}$ " H x 13 $\frac{3}{8}$ " D.



Turn on your Benton Harbor maxi-rig!

The New Heathkit® SB-220

Business end of the Maxi-Rig! Gives your signal the authority it takes to punch through those pile-ups (or start one yourself). And keeps you operating under conditions that drive the other guys QRT.

A pair of conservatively rated Eimac 3-500Z's provide up to 2000 watts PEP SSB input ... 1000 watts on CW and RTTY. Requires only 100 watts PEP drive. Pretuned broad band pi-input coils deliver maximum efficiency and low distortion on the 80-10 meter bands.

The built-in solid-state power supply can be wired for either 120 or 240 VAC and switched back again in minutes if your power requirements change. Circuit breakers provide added protection and eliminate costly fuse changing. And for cooler operation and extended tube life, idling plate current is reduced by Zener diode regulated bias.

The layout of the new "220" is designed for fast, high volume air flow with a husky, quiet fan in the PA compartment doing the job. Result: the "220" actually runs cooler than most excitors.

Other features include two front panel meters for continuous monitoring of Ip plus switch-selected monitoring of Rel. Pwr., Ep & Ig ... ALC output to reduce over-driving and distortion ... safety interlocked cover ... easy 15-hour assembly and handsome Heathkit SB-Series styling.

Tired of stumbling barefoot through the QRM? Order the shoes for your Maxi-Rig now ... the new "220" ... another hot one from the Hams at Heath.

- Full 2 kW PEP input on SSB ... 1 kW on CW and RTTY
- Boardband pi-input on 80 through 10 meters
- Two Eimac 3-500Z tubes
- 120 or 240 VAC wiring options
- Zener diode regulated operating bias for reduced idling plate current, longer tube life, cooler operation
- Double shielded to reduce stray radiation
- Solid-state power supply
- Two front panel meters for continuous monitoring of plate current, plus switch selected monitoring of Rel. Pwr., plate high voltage and grid current
- Quiet, high volume fan for cool running
- ALC output
- Easy 15 hour assembly.

Kit SB-220, 55 lbs.....\$349.95*

SB-220 SPECIFICATIONS — Band coverage: 80, 40, 20, 15 and 10 meter amateur bands. **Driving power required:** 100 watts. **Maximum power input:** SSB: 2000 watts P.E.P. CW: 1000 watts. RTTY: 1000 watts. **Duty cycle:** SSB: Continuous voice modulation. CW: Continuous (maximum key-down 10 minutes). RTTY: 50% (maximum transmit time 10 minutes). **Third order distortion:** —30 dB or better. **Input impedance:** 52 ohm unbalanced. **Output impedance:** 50 ohm to 75 ohm unbalanced; SWR 2:1 or less. **Front panel controls:** Tune, Load, Band, Sensitivity, Meter switch, Power CW/Tune — SSB, Plate meter, Multi-meter (Grid mA, Relative Power, and High Voltage). **Rear Panel:** Line cord, Circuit breakers (two 10 A), Antenna Relay (phono), ALC (phono), RF Input (SO-239), Ground post, RF output (SO-239). **Tubes:** Two Eimac 3-500Z. **Power required:** 120 VAC, 50/60 cycles, at 20 amperes maximum. 240 VAC, 50/60 cycles at 10 amperes. **Cabinet size:** 14 $\frac{7}{8}$ " W x 8 $\frac{1}{4}$ " H x 14 $\frac{1}{2}$ " D. **Net weight:** 48 lbs.



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AM-238



INTRODUCING THE NEW SWAN-1011

*Designed especially for the serious 10 meter operator
Optimized for highest standards of sensitivity,
selectivity and all-out performance.*



A 260 watt 10 meter SSB/AM transceiver,
complete with built-in AC power supply,
loudspeaker, plus tunable receiver coverage
of the 11 meter Citizen's Band.

SPECIFICATIONS:

- Power rating: 260 watts P.E.P. input, 180 watts CW input, 60 watts AM input.
- Frequency Range: 28.0 — 28.5, 28.5 — 29.0, 29.0 — 29.5, 29.2 — 29.7, plus a special 26.96 — 27.23 mc receiving range for monitoring the Citizen's Band. *(Note) In the Citizen's Band position the transmitter relay circuitry does not function.
- Voltage input: 117 volts AC or 12-14 volts DC.
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- Selectable upper and lower sideband
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Model 1011 Transceiver \$499

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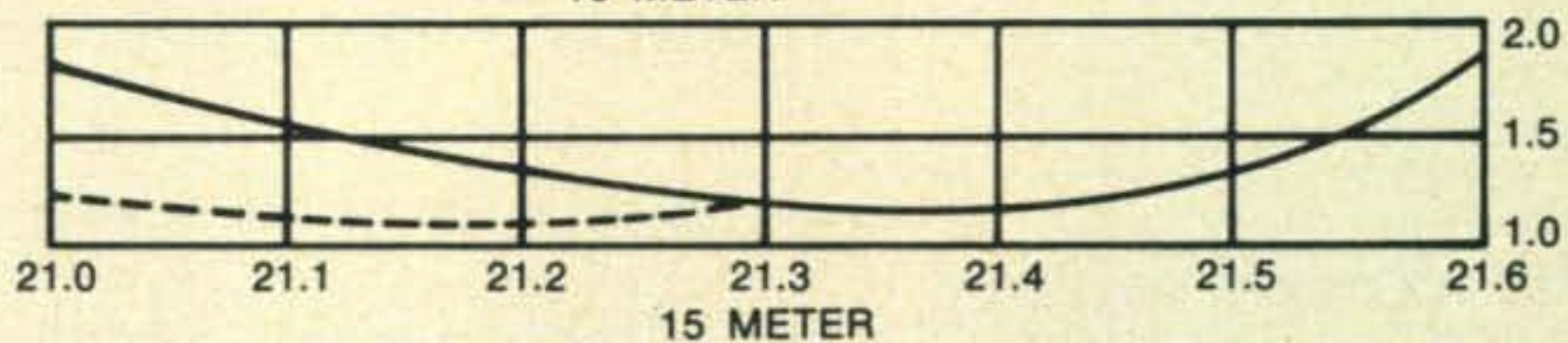
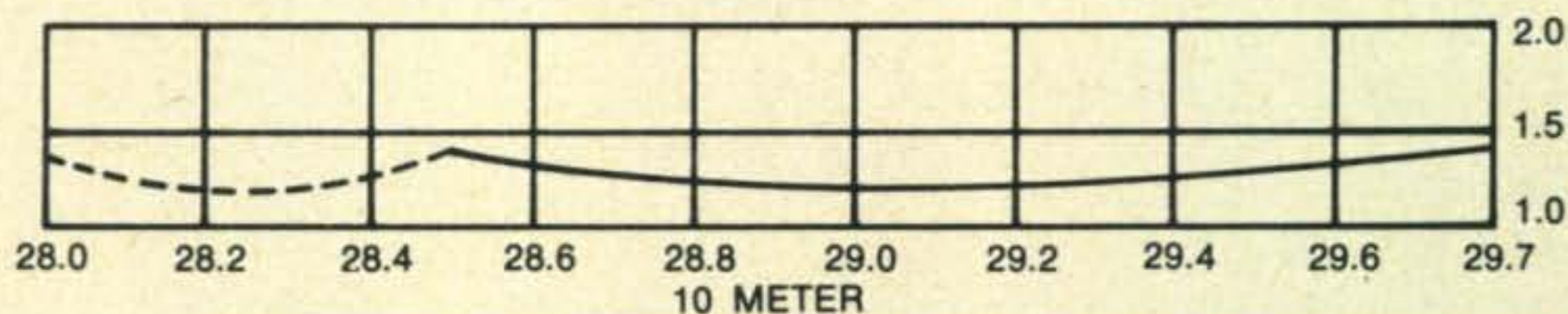
HY-GAIN'S 14 AVQ/WB

(40 through 10 meters)

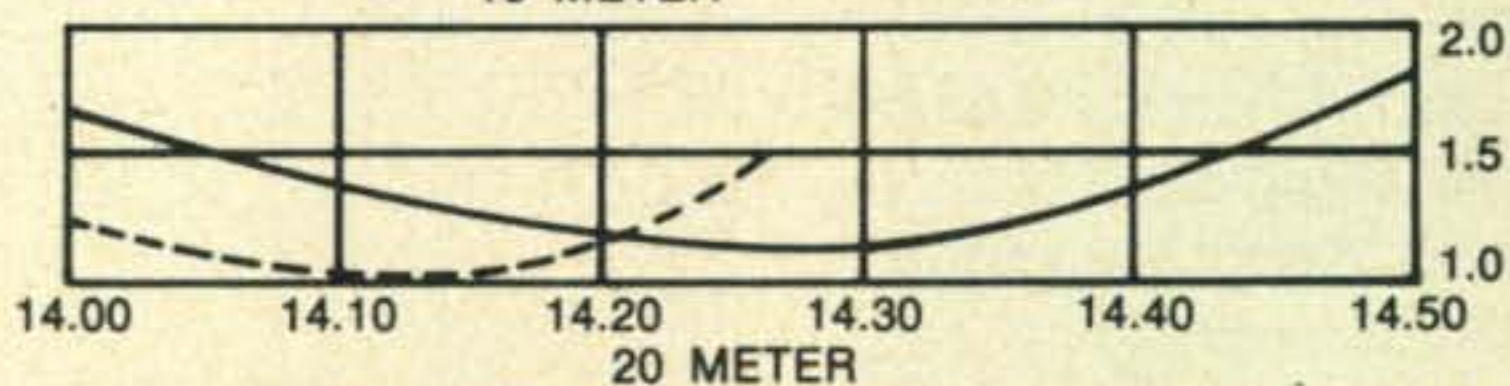
The First, Most Copied and still the Greatest Multi-Band Vertical GOES WIDE BAND

With Hy-Gain's 14AVQ/WB, you get wide band operation with just one setting (although we still give you two settings for optimum performance on phone or CW). And here are some of the other features that have made this trap vertical the most popular:

- Exactly spaced, large diameter Hy-Gain Hy-Q traps with exceptionally favorable L/C ratio for maximum efficiency.
- Traps wound on low loss polystyrene cores to eliminate detuning through moisture absorption.
- Traps precisely tuned electrically for optimum performance across the band.
- All elements taper swaged for less wind loading and greater strength.
- Full circumference clamps of aluminum; no dissimilar metals; no damage to tubing.
- Exclusive DC ground feature to drain off precipitation static.
- Nominal 52 ohms at resonance feed for lowest SWR.
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- All aluminum brackets for years of service with no corrosion.
- For better matching sealed SO 239 connector.
- Can be ground or roof mounted.

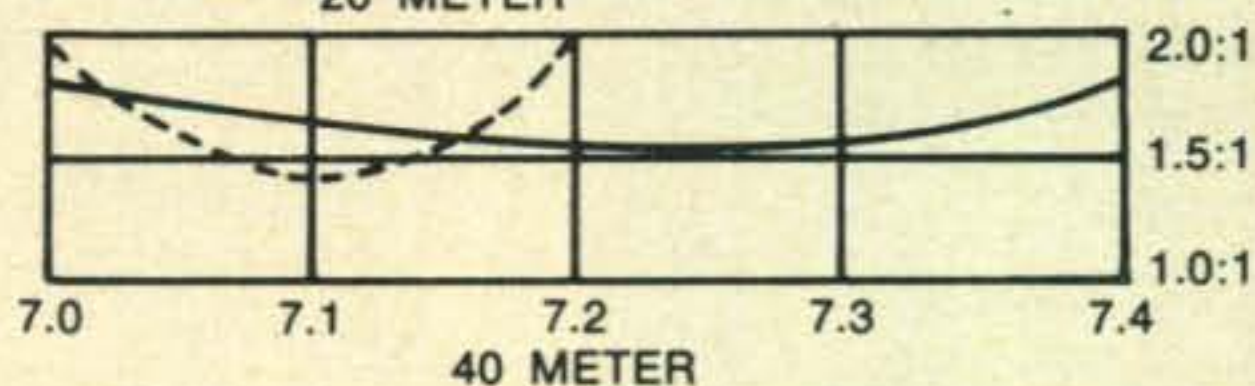


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CURRENT ACCESSORIES LC-80—Loading coil to adapt to 80 meter operation. 14 RMQ—Roof mounting kit.

HY-GAIN ELECTRONICS CORPORATION

P.O. Box 5407-FJ, Lincoln, Nebraska 68505



ZERO BIAS

It is ordinarily *CQ*'s policy to refrain from commenting on matters solely affecting the internal workings of ARRL, although over the years we've been quick to criticize ARRL's handling of certain situations affecting more than just ARRL's membership, such as DXCC and Project OSCAR. Another such situation has developed over the past few years, and recently came to a head. The situation: Canadian independence from ARRL.

Canadian amateurs have for years been in a peculiar position in ARRL. They've been members, but they've been represented in only the most superficial way. It isn't hard to understand. Of the sixteen ARRL directors, one represents *all* Canadian amateurs in *all* ten provinces. There are seven SCM's, but still at board meetings only one Canadian voice is heard.

More important is the problem of having a U. S. based organization trying to act as liaison between Canadian amateurs and Canadian authorities. Obviously the system works to some extent, but equally obvious is the fact that there are better ways. For example, an all-Canadian League could do a better job of lobbying in Ottawa for more realistic import duties on electronic equipment than can ARRL.

With these problems in mind, Canadian writers and editors have been muttering for the past few years about a Canadian League. One early step in that direction was taken in September 1967 with the formation of the Canadian Amateur Radio Federation. CARF was and is not a league. It is a federation of provincial level amateur radio organizations, but it is a realistic effort by Canadians to join together to provide direct-line communication between themselves and the Canadian government.

More recently, in January of this year, Art Blick, VE3AHU, with Canadian Division ARRL Director, Noel Eaton, VE3CJ, developed a carefully worded proposal to ARRL of the next realistic step in the development of an independent Canadian version of ARRL: a proposed "Amalgamation - Canadian Division ARRL and CARF." The essence of the proposal: "...The formation of a distinct Canadian organization that would work with, and be affiliated to, the ARRL, and with an arrangement such that the many features of the League would be available to members The organization to be on the basis of individual membership, with dues similar to that of ARRL - \$7.00/year (Canadian) - organized on the CARF structure and with *QST* as the national magazine. The President of CARF to attend meetings of the ARRL Board of Directors as a non-voting member and vice-versa. Present ARRL officials (SCM's, etc.) to remain but to be CARL officials with returns of activities, etc., sent by CARL to ARRL."

The proposal goes on to describe in detail a logical and orderly transition of officers and functions from the Canadian Division ARRL to the Canadian League (CARL). With a proposed transfer of \$4.00 of each \$7.00 dues to ARRL to cover the cost of *QST* and services such as DXCC, etc., a modest \$10,000 (est.) per year would remain to pay operating expenses and to expand facilities, certainly a modest budget compared to ARRL's megabuck status. Requested by CARF was a limited amount of space in *QST* to publicize Canadian happenings.

All in all, the proposed amalgamation seems to fit the growing needs of Canadian amateurs, with the minimum of disruption in services and administration on both sides of the border.

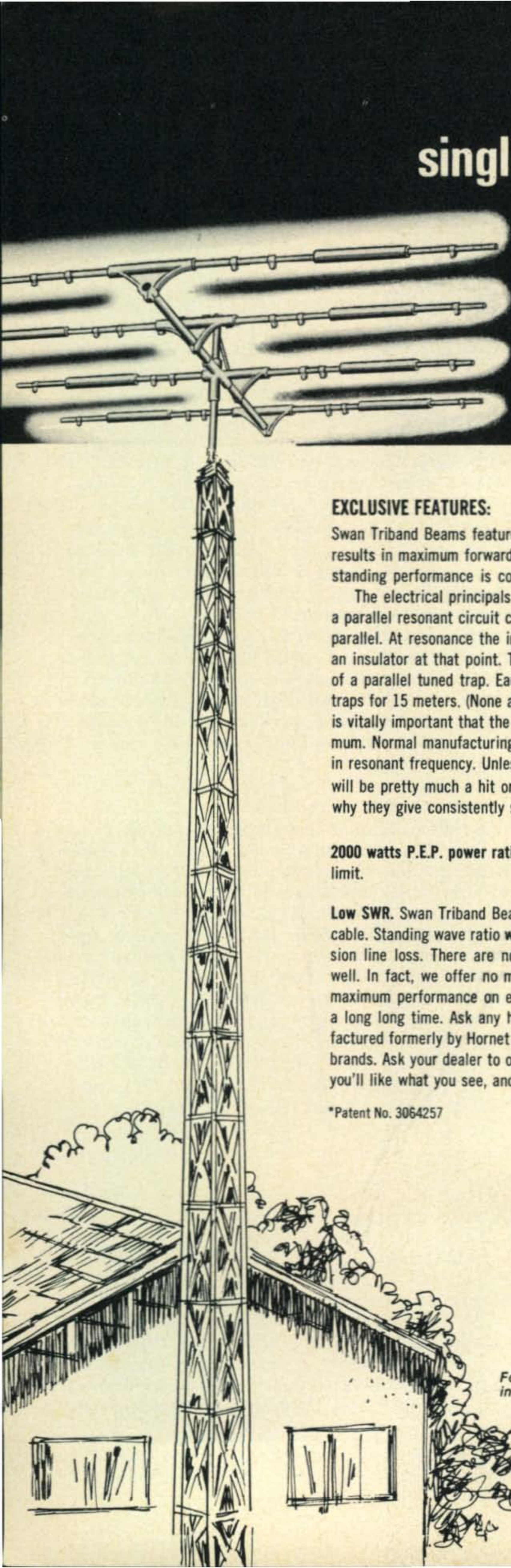
When presented to ARRL, Canadian hopes were high that the League would have the vision to see that Canadian amateurs were ready to take over the reigns of their own cart. That cart might have some rough roads to traverse, but the spirit of the modern Canadian ham *demand*ed that they take charge of their own future.

On May 15, 1970, in a letter signed by Director Eaton and ARRL President Denniston, the League rejected the Canadian amalgamation proposal.

As if simple rejection were not enough, the reasons given were so transparently contrived and concerned with picayune details that it appears obvious that the sole concern of ARRL is maintaining its own dominant position in amateur politics, rather than serving the needs and desires of 12,000 Canadian amateurs. Capping the whole matter is a classically patronizing statement: "...a possibility which must be faced [is] the problem of reverting to the present status should the proposed structure be adopted and then found a failure." As VE3AHU aptly put it in his reply to ARRL President Denniston, "The prospect of complete failure reflects, I am afraid, an attitude of: 'You Canadians are fine fellows and good Amateurs but completely incapable of running your own affairs.'"

To say that ARRL has erred in turning down the Canadian proposal is too mild. The ARRL rejection will probably go down in history as the turning point in Canadian amateur radio, for with or without the support of ARRL, there *will* be a Canadian League, and even without rendering assistance in CARL's formation, ARRL's influence and stature in Canada *must* diminish. These things could have occurred in a friendly, cooperative atmosphere. Instead, they will occur in an atmosphere charged with antagonism and distrust. ARRL has blundered.

73, Dick, K2MGA



single band performance with

**SWAN
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EXCLUSIVE FEATURES:

Swan Triband Beams feature a patented* trap design which permits precision factory adjustment. This results in maximum forward gain and front-to-back ratio from each and every Swan antenna. Their outstanding performance is comparable to single band antennas having the same number of elements.

The electrical principals employed in a trap type multi-band antenna are quite simple. The "trap" is a parallel resonant circuit consisting of a high Q inductance with a coaxial sleeve capacitor connected in parallel. At resonance the impedance across the trap is very high, and its effect is the same as inserting an insulator at that point. Thus, the electrical length of the antenna element can be altered by insertion of a parallel tuned trap. Each element in a Swan Triband Beam has two traps for 10 meters, and two traps for 15 meters. (None are required for 20 meters since the elements are full length on this band). It is vitally important that the traps are tuned to exact frequency, or antenna performance will not be optimum. Normal manufacturing tolerances in the coil and capacitor assembly create considerable variation in resonant frequency. Unless the trap has some means for precise adjustment, its resonant frequency will be pretty much a hit or miss affair. The exclusive precision tuned traps in Swan antennas* explain why they give consistently superior performance.

2000 watts P.E.P. power rating: All models of the Swan Triband Beams are rated at the full legal power limit.

Low SWR. Swan Triband Beams are designed for a near perfect match on each band with 52 ohm coaxial cable. Standing wave ratio will be down as low as 1.2 at band center, resulting in extremely low transmission line loss. There are no gimmicks or gadgets in the feed system. It's very simple, and works very well. In fact, we offer no magic whatsoever in our antennas, except that they are designed to provide maximum performance on each band, and mechanically built to withstand severe weather conditions for a long long time. Ask any ham who owns one. The Swan antenna is an improved Hornet design, manufactured formerly by Hornet Antenna Products. Compare the Swan Tribander feature for feature with other brands. Ask your dealer to open up the shipping carton and let you inspect the Swan antenna. We think you'll like what you see, and like its performance even more.

*Patent No. 3064257



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For better ideas
in amateur radio.

patented * tuneable traps

TRIBAND ANTENNAS

AND 20 METERS

4 ELEMENT MODEL TB-4H

The Swan 4 Element Heavy Duty Triband Beam gives you 4 working elements on each band: 10, 15, and 20 meters. A 24-foot boom permits optimum spacing for maximum forward gain and front-to-back ratio. All traps have been precision tuned and weather proofed. The Heavy Duty mechanical design of the TB-4H means that it will easily take winds up to 100 mph, and provide years of reliable service in any kind of climate from the arctic to the tropics.

- Forward Gain: 9 db average
- Front-to-Back Ratio: 24-26 db
- Power Rating: 2000 watts P.E.P.
- Weight: 64 lbs.
- Wind Load at 80 mph: 148 lbs.

Price: \$169

3 ELEMENT MODEL TB-3H

Same Heavy Duty design as the TB-4H, but with 3 elements on a 16-foot boom.

- Forward Gain: 8 db Average
- Front-to-Back Ratio: 20-22 db
- Power Rating: 2000 watts P.E.P.
- Weight: 44 lbs.
- Wind Load at 80 mph: 110 lbs.

Price: \$139

3 ELEMENT MODEL TB-3

Of somewhat lighter construction and shorter boom length, the TB-3 is adequate for many installations. Wind survival rating is 80 mph compared to the 100 mph rating of the TB-3H. Its lighter weight permits easier erection, a lighter weight tower, and lighter duty rotator, all resulting in lower overall cost. The same precision tuned, weather proofed traps are used, so power rating and reliability are the same as in heavier duty models. Boom length is 14 feet.

- Forward Gain: 7.5 db average.
- Front-to-Back Ratio: 18-20 db
- Power Rating: 2000 watts P.E.P.
- Weight: 37 lbs.
- Wind Load at 80 mph: 92 lbs.

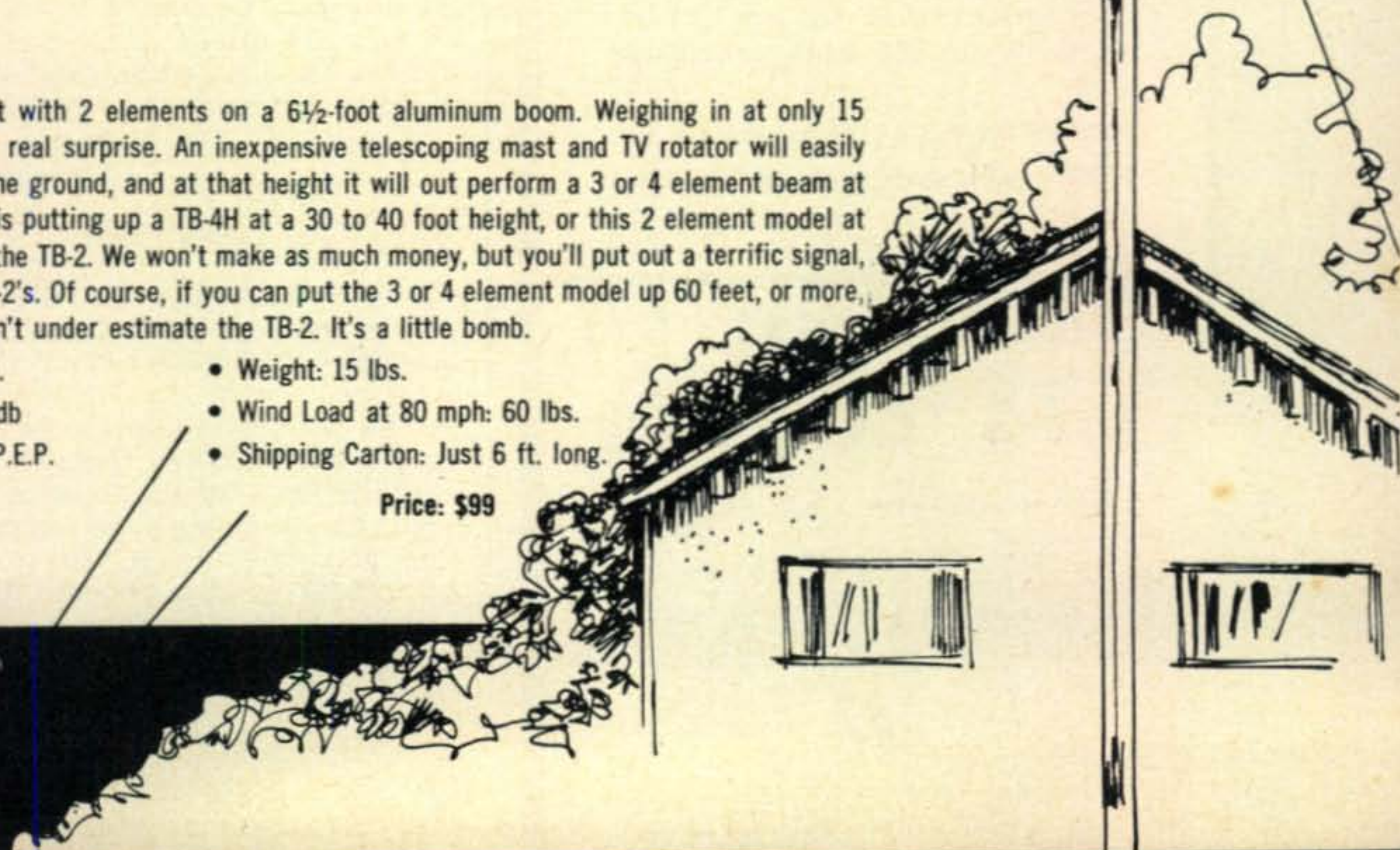
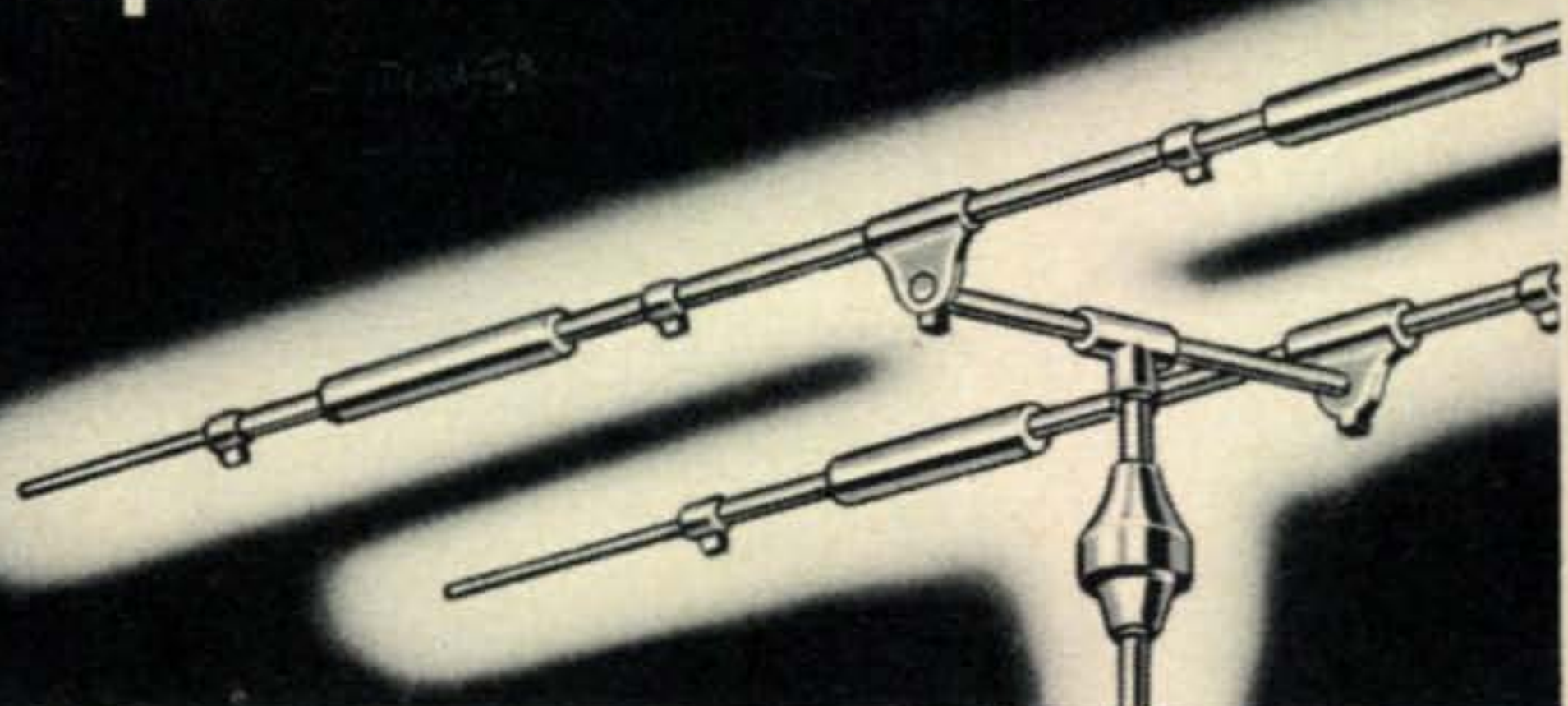
Price: \$119

2 ELEMENT MODEL TB-2

Same design as the TB-3 but with 2 elements on a 6½-foot aluminum boom. Weighing in at only 15 pounds, this model can be a real surprise. An inexpensive telescoping mast and TV rotator will easily get it 60 feet or higher off the ground, and at that height it will out perform a 3 or 4 element beam at lesser height. If your choice is putting up a TB-4H at a 30 to 40 foot height, or this 2 element model at 60 feet, by all means put up the TB-2. We won't make as much money, but you'll put out a terrific signal, and maybe we'll sell more TB-2's. Of course, if you can put the 3 or 4 element model up 60 feet, or more, there's no argument. Just don't under estimate the TB-2. It's a little bomb.

- Forward Gain: 5 db Average.
- Front-to-Back Ratio: 16-18 db
- Power Rating: 2000 watts P.E.P.
- Weight: 15 lbs.
- Wind Load at 80 mph: 60 lbs.
- Shipping Carton: Just 6 ft. long.

Price: \$99



Designed for



Application



TRANSMATCH or TRANSMATCH JUNIOR

Allows a transmitter to work into the 50 ohm unbalanced load for which it was designed. Converts a multi-band antenna to 50 ohms at all amateur frequencies between 3.5 and 29.7 MC. Match 10 to 300 ohm unbalanced loads.

92200 TRANSMATCH handles a kw.
92201 TRANSMATCH JUNIOR handles 150 w.

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OUR READERS SAY

SWR's Significance

Editor, CQ:

In "Convert SWR into Watts" (June CQ) the author refers in the first paragraph to "lost" R.F. power. A little later we read that "s.w.r. of 1:1 is perfect; all power sent to the antenna, except for inherent line losses, is radiated." The balance of the paper elaborates the idea that something is different when the s.w.r. is not 1:1.

One of the basic laws of nature is the law of conservation of energy. In a system where there is no long-term energy storage (such as a transmission line and antenna), it can be rewritten as the law of conservation of power since power is energy per unit time. So no matter what the s.w.r. or "forward" or "reflected" power may be, we are obliged to state that: Power into the line = Power delivered to the load (antenna) + Power dissipated in the line.

Returning to the article in question, we find an example of a line with 100 watts input which apparently all gets to the load where 4 watts is reflected. Since there was no dissipation of the forward power it follows that there can be no dissipation of the reflected power so the line is dissipationless by hypothesis. Consequently, we have 96 watts out of the line and 96 watts into the line. No power is lost; The s.w.r. of 1.5:1 has not created an inefficiency. The principal significance of an s.w.r. of 1.5:1 is that the impedance seen by the transmitter (on a 50 ohm basis is not restricted to 50 ohms but varies (depending upon the electrical length of the line) through a family of impedances as low as 33 ohms and as high as 75 ohms pure resistance and a host of intermediate values all of which are either inductively or capacitively reactive. Whether a transmitter rated for 100 watts into a 50 ohm load will deliver 96 watts into such an impedance with proper linearity, harmonic rejection, etc. is another question entirely.

Now it is quite true that the power dissipated in a lossy line goes up with higher s.w.r. A line with, for instance, 1/2 db loss at s.w.r. = 1:1 will have about 1 db loss at s.w.r. = 4:1 (when the so-called reflected power is 36% of the forward power!)

Forward and reflected power are, dimensionally speaking, properly states in watts. However, they are abstractions and their use should be confined to two operations: their ratio, as is correctly indicated in the article, can be used to find s.w.r.; and their difference gives the real power in the system.

Walter H. Anderson, VE3AAZ

Toronto, Ontario, Canada

Jordanian Tourism

Editor, CQ:

I have recently become aware that arrangements are now in progress for a plan to license tourists visiting Jordan. Perhaps this step forward will be in the "right direction" some time in the future, but at the present time I think it inadvisable for any ham to take advantage of the privilege. On the basis of my own experience in Jordan, I cannot urge strongly enough that anyone contemplating a visit to Jordan reconsider his plans, for the situation there is both critical and dangerous for foreigners.

Last week, while walking along the main street of Amman, during the noontime rush hour, I was

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singled out as a Westerner by a terrorist Commando. He could not possibly have recognized me as an American - just a foreigner. Nevertheless, and with no provocation on my part, he saw fit to attack me with a sharpened metal rod. Sparing the reader the details of the scene that ensued, let me just say that the result was a minor concussion and four stitches in my head.

It was only later that I learned from an Egyptian advisor to Jordan that even he and his wife find it necessary to carry pistols at all times to ensure their physical safety.

So how can the foreign tourist protect himself?

Larry Pace, K2IXP

Brooklyn, N. Y.

Free Ham Ads

Editor, *CQ*:

I do not know who it was that came up with the idea of giving a free ham ad a month to your subscribers, but from this end it was a wonderful idea. I do not also know how long you intend running it, but I should think it has enlarged your subscription rolls quite a bit.

I have taken advantage of this service four times and have sold the item as soon as *CQ* hit the street in three of the four times. That is 75% and the fourth item seemed to be plentiful in your ads.

I have taken *CQ* magazine for better than ten years now and have always enjoyed its articles, but I consider I have had my money's worth in these ads alone. So keep up the good work of being the leading "ham magazine..."

I have also heard that our old friend and helper, Walter Burdine, of Waynesville, Ohio, who was your Novice column writer for years and finally had to break off his many years of making a ham contact each day. About a week ago, Walt had a bad heart attack and is in the Hospital in "intensive care." I have enjoyed his column, enjoyed his QSOs and have enjoyed talking with him "eye ball" many times. Let's all send him a QSL wishing him a speedy recovery.

Harold D. Mohr, K8ZHZ

Gahanna, Ohio

USA-CA

Editor, *CQ*:

I was very disturbed by the omission of the Awards Program portion of *CQ*. Since this is the most important part of this publication (in my opinion) *CQ* has rendered me a great disservice.

I am certain that the county hunters throughout the world will be very unhappy with this omission and there are large numbers of this group that rely solely on *CQ* for news of their particular group.

The comments and personal letters from Ed Hopper has been a highlight of my amateur radio operation for the past five years and I'm sure many others feel the same way.

Please reinstate this part of *CQ* at once.

Charles O. Rick, WØBL

St. Louis, Mo.

WØBL's comments are typical of dozens received by *CQ* in response to the unavoidable omission of the Awards Program by Ed Hopper, W2GT, from the July/August issue. We assure all of Ed's faithful followers that the omission was indeed temporary, and caused by a missed deadline. It's never happened before and will probably never happen again. Our apologies. -Ed.

The Lightweight Champion with the HIGH POWER PUNCH!

No doubt about it, the Ham Cat antenna *delivers!* More power capability than any of the others with lower VSWR. Higher Q than any of the others without sacrificing broad band performance. Lower loss high-efficiency coils provide higher radiation effectiveness than all others. And the Ham Cat can operate at full power with less drifting.

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- Lowest VSWR in any mobile available.

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- Turn-over mast is hefty $\frac{5}{8}$ " dia. solid rod of polished heat-treated aluminum.
- All connections are standard $\frac{3}{8}$ -24 thread.
- Mast folds over, swivels, and turns over so that it can be mounted on bumper or deck. Flexibility makes it easy and simple to change coils.
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SCRATCHI

Deer Hon. Ed:

The greatest thing are just happening to me—I sprained my hip. It are reely nicest thing happening to me in long time. Whoa, Hon. Ed., don't get eggscited. No needing to making long distance call to getting me put in the loony bin. Letting me explain first.

The how I doing it are easy to explain. I are on a nite out in a local cantina with my XYL-to-be, Lil Watanabe, for a spot of dining and dancing. Everything fine until in the middle of a dance the band changing tempo from slow music to fast Mexican dance. I trying to shift geers in my dance step and my hip are not getting the message. Whammo!!

Hon. Doctor saying there being no need for me to going to hospital—just having to going to bed and staying off my feets for cupple weeks. He even saying I can sitting up in bed if I wanting to. Boy oh boys, Hon. Ed., I reccomending this to everyone!

First nice thing about it are Lil Watanabe—she promising to come visit me every day and make sure I having all the things I needing. Gracious to goodness, it are just peechy to be waited on!!

When she coming over the first time, I have her gathering up all old amchoor magazines I not yet getting chance to reed. It being quite a bundle, but I managing to go thru them in a cupple of days. Even making some notes on things I wanting to bild.

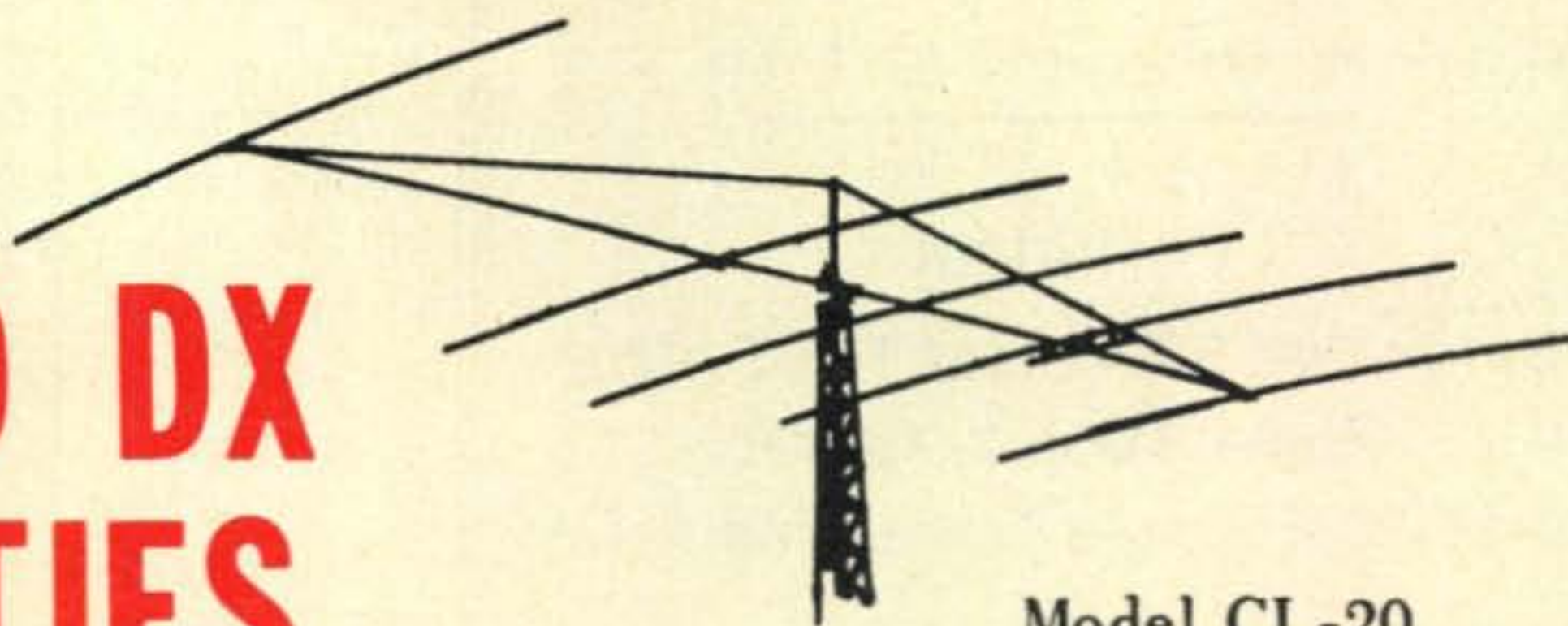
Are noting one artickle on antennas, so desiding to bild when are getting up, one of them being described. Spending one hole day figyouring out dimenshuns, heights, and that sort of thing. Great fun!

But that's only the beginning. I having Lil get out my logbooks and I spending cupple more days riting and addressing QSL cards. Whooiee! was that a job. I riting 599x so often I getting finger cramps.

Toward end of second week, sort of running out of things to do. So, having Lil run-

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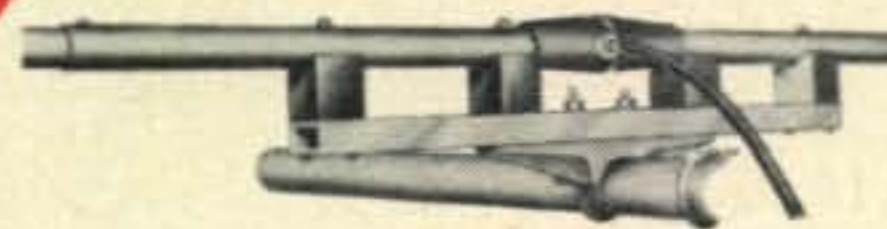
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- TURNING RADIUS: 28 ft.
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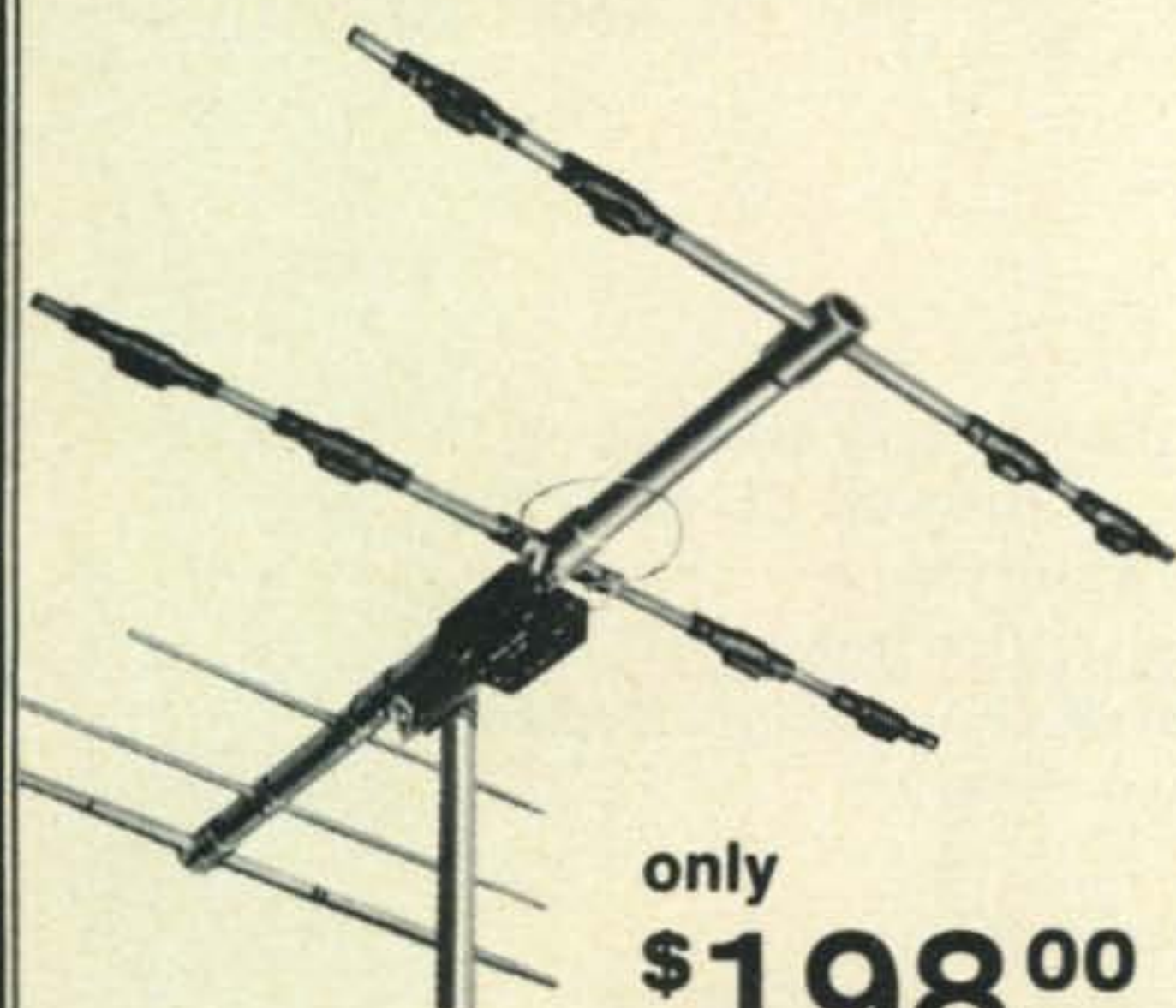
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ning out and buying me a cupple hundred Xmas cards. I addressing them, riting notes on some of them, seeling them and stamping them. What a grand and gloryus feeling! It not even December, and my Xmas cards are all done.

But—I not yet telling you the bestest thing that happening to me. As I are beginning to get up and around, slowly, I getting a circular saying that the local amchoor club are hold-ing a contest for most original mobile instal-layshun. I desiding to enter.

By this time I able to be on my feet and get around with what the Hon. Doc. calls a "walker." You not knowing what a "walker" is, Hon. Ed?

A walker is a U-shaped contrapshun about 3 or 4 feet high, bilt of toobular aloominum. To use it, you stand in the middle of the "U", with opening behind you. Then you lift it and put it down one-foots away in direckshun you want to walk. Then you walk into it, holding on to it all the time.

Well, anyhow, using the walker, I able to get to shack and workshop. So are fixing up reel slicky xmitter and reseever. You know what I putting them on?

On the walker, of course! Mounting dry-cell batteries in the toobular legs, attaching xmitter and reseever to one of the cross-braces and having whip antenna on one side.

Are trying it out, and working several local cats five by nine. On day of contest, Scratchi are all back to normal, so I tossing walker in jeep and taking off.

The place they holding contest is a mad-house. In addition to eleventeen cars with mobile rigs in 'em, there are cupple dune buggies, several trucks, quite a few campers, lotsa bicycles, motorcycles and minibikes.

Well, to making long story short, gess who walking away with first prize? Yes indeedy, good old Scratchi, walking away with first prize with his walker.

There are some big eggscitements when several sorehed losers saying my "walker" are not a vehicle. Howsumever, judges say-ing they letting it and the scooter enter even tho not self-powered, and once entered, are eligible for any prize they can winning!

Hon. Ed., you should sprain your hip! You'll get a lot of rest, you'll catch up one things you should have done long time before, and even tho you not winning new reseever like I did, you feeling great all over.

Happy amchoor day. Respectively yours,
Hashafisti Scratchi

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Announcements

Findlay, Ohio

The Findlay Hamfest will be at Riverside Park on Sept. 13. Tickets and information can be obtained from Clark Foltz, W8UN. Tickets are \$1.00 in advance, \$1.50 at the park. Bring the whole family. Flea market. Food available at the park.

Albuquerque, New Mexico

The Albuquerque Amateur Radio Club and The Caravan Radio Club of New Mexico will sponsor The New Mexico Hamvention at Albuquerque, New Mexico on Sept. 18th, 19th and 20th. This will coincide with the New Mexico State Fair which is being presented from the 17th through the 27th of Sept. Hamvention HQ will be at the Holliday Inn East, East Highway 66. There is a banquet planned along with numerous activities for everyone. Talk-in frequencies: 3990, 7293, 14345, 2900 (a.m. and f.m.), 146.34-146.94 mc repeater and 146.94 mc direct n.b.f.m. For further information and registration, please contact: Ray Hill, 9016 Los Arboles Ave. NE, Albuquerque, New Mexico 87112. Phone: 505-299-1719.

Peoria, Illinois

The Peoria Area Amateur Radio Club, Inc. will hold its 13th annual hamfest Sunday, Sept. 20th at Exposition Gardens (same place as last year), located on the northwest edge of Peoria, Ill. Plenty of activities for the entire family. Everything starts at 9:00 A.M. with free doughnuts being given out for the first half hour. Advance registration is \$1.50, \$2.00 at the gate. For further details and advance registration write to Ferrel Ilytle, W9DHE, 419 Stonegate Road, Peoria, Illinois 61614.

Boston, Mass.

The New England DX Association (NEDXA) will hold its annual banquet, in conjunction with the ARRL National Convention, on Saturday, Sept. 26th at the Statler Hilton Hotel in Boston. A luncheon will be served along with a slide presentation by Bob Denison, W0DX on the Malpelo Island DXpedition. Sunday there will be a DX Forum. Information and tickets for the luncheon can be obtained from: Chuck Banta, W1SHN, 90 Park Ave., East Lowell, Mass. 01852.

Bergenfield, New Jersey

The Windblowers V.H.F. Society will sponsor the 16th annual Big Blow Contest on Saturday, Sept. 26th from 1300 to 2000 E.D.S.T. There

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[Continued on page 94]

The day Bill told off his boss

GET IN HERE, BILL!
I WANT TO TALK TO YOU!

YOU TOOK TOO LONG TO
MOVE THOSE CARTONS
OUT OF THE STOCK ROOM
YESTERDAY. YOU'LL HAVE
TO SHAPE UP OR SHIP OUT!

OH, YEAH? WELL, I'VE
GOT NEWS FOR YOU,
MR. JOHNSON. I'VE GOT
A NEW JOB... AT
TWICE THE SALARY!

YOU'RE KIDDING!
YOU'RE NOT
GOOD FOR
ANYTHING BUT
ODD JOBS!

THAT'S WHAT
YOU THINK!
I'VE BEEN
LEARNING
ELECTRONICS
IN MY SPARE
TIME AT HOME
FROM **CIE**...
AND NOW I CAN
TAKE MY PICK
OF GOOD JOBS!

ELECTRONICS? HOW
COULD YOU LEARN
ELECTRONICS?

THAT'S WHAT I
THOUGHT, TOO. BUT
CIE MADE IT EASY.
SO LONG, YOU
OLD SLAVE DRIVER!

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CQ-54

A SOLID STATE PERMEABILITY TUNED VFO WITH DIGITAL FREQUENCY READ-OUT

BY JACK PEROLO,* PY2PE1C

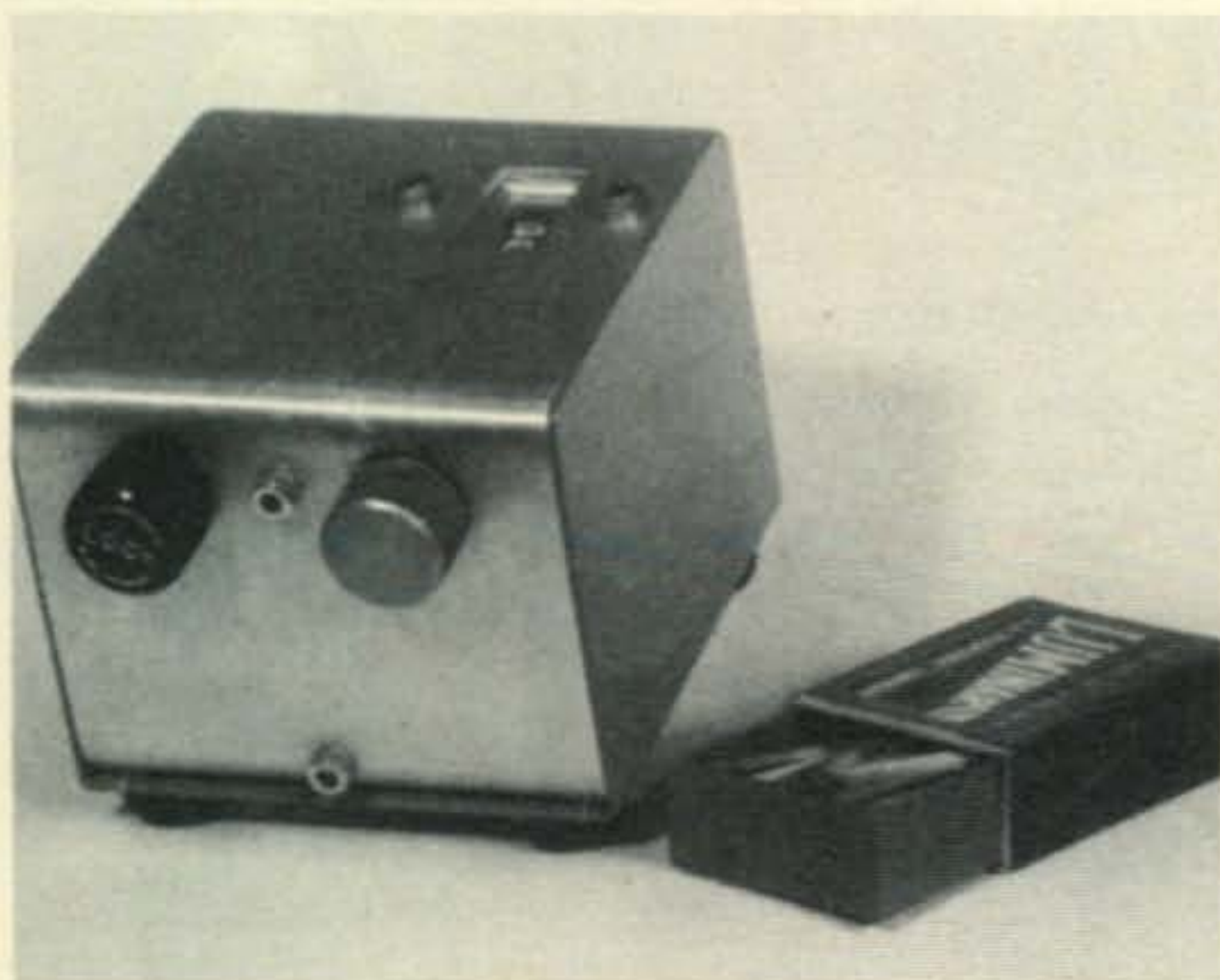
PREVIOUS projects by the author, mostly related with homebuilt receivers and receiving gear,¹ emphasized the handiness of a separate, stable, calibrated v.f.o. An accurate signal source, as the one described below, was primarily designed and built with the following objectives in mind:

1. As a remote v.f.o. for the 60 m. broadcast band (4,750-5,060 kc) when associated to a 455 kc i.f. strip.
2. As a remote v.f.o. for the 20 m. ham band (14,000 kc and up) when associated to a 9 mc i.f. strip.
3. As a developmental step to acquire better knowledge of permeability tuned systems, and to achieve linearity and stability by the easiest possible means, associated to small size.

The last item is particularly important, mainly remembering the considerations brought forth in a previous article.¹ In fact,

*P.O. Box 2390, S. Paulo, Brazil.

¹Perolo, J. "A Transistorized Communications Receiver With Digital Frequency Readout," *CQ*, July/Aug. 1970, p. 14.



Front view of the finished v.f.o. The left knob is the FREQUENCY control, whereas the right knob is the TUNING. The two 6-32 Allen head screws at the front center hold the gear mechanism in place. The matchbox at the right gives an idea of the small size of the unit (2.4" × 2.75" × 2.4" overall).

a permeability tuned oscillator is bound to be compact (as there is no main variable capacitor in the system), and spares the whole receiver from the vibrations derived from the tuning capacitor filing, as mentioned in reference 1. Freedom from microphonics is only a marginal advantage, as most of my previous projects were completely microphonic free, possibly because of their solid state circuitry, associated with the use of wide spaced sturdy variable capacitors.

Two experimental permeability tuned oscillators were breadboarded; the third unit was assembled as a permanent set-up, and that is what this article refers to. It is housed in a 2.4" × 2.75" × 2.4" box and covers 5,000 to 5,600 kc.

Circuit Considerations

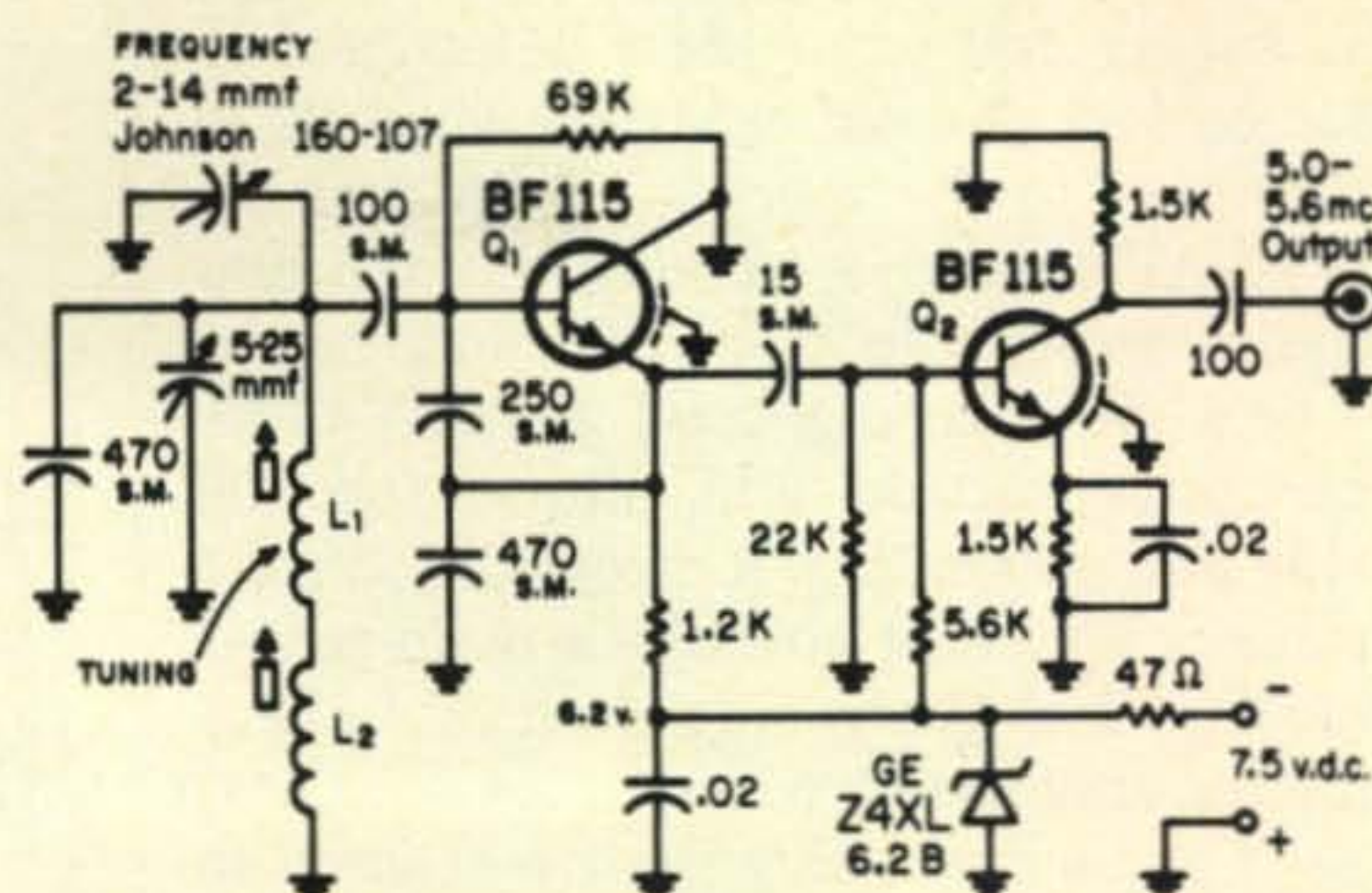
The oscillator circuit (fig. 1) is that basically reported in reference 1 without modifications. The only change consisted of an altogether different L/C ratio, as the coils used were different from those in the receiver, and iron slug characteristics changed; furthermore, in order to obtain the desired correspondence between linearity, frequency coverage and frequency read-out, further L/C ratio changes were brought in during alignment procedures. With this purpose in mind, the main oscillator coil was split into two individual coils in series (L_1 and L_2 to ease final tuning, one coil (L_2) being a regular screwdriver slug unit, whereas the second coil (L_1) is acted upon by the tuning mechanism to be described later.

The v.f.o. cabinet incorporates an aperiodic $R-C$ coupled buffer stage and a zener diode to stabilize the power supply. The buffer stage permits using coax cables of different lengths without causing frequency shifts with reference to the read-out counter.

The Miller 4400 coil selected as main tuning coil (L_1) was chosen because its relatively large size ($\frac{3}{8}$ " diameter) allowed better mechanical adaptation to this project.

The counter is a Veeder-Root affair, model

Fig. 1—Circuit of the solid state permeability tuned v.f.o. with 5.0-5.6 mc output. Tuning inductor L_1 is slug tuned through a gear drive mechanism which also drives a Veeder-Root counter frequency read-out. Coil specifications: L_1 -8t #22 plastic insulated wire (see text) wound on Miller #4400 slug tuned coil form $\frac{3}{8}$ " dia. L_2 -10t. #30 enamelled wire close-wound on Miller #20A000 $\frac{1}{4}$ " dia. slug tuned coil form.



IL-114134 N, with three digits and a built in slotted shaft.

Both transistors are silicon, manufactured by Phillips with an $F_{cut-off}$ well over 100 mc. The only reason a positive ground was preferred was to make this v.f.o. compatible with all my previous transistorized homebuilt gear. Negative ground units assembled by PY2GP displayed the same performance.

Construction

Figure 2 shows a simplified exploded view of the mechanical arrangement chosen. This unit was built around a surplus parallel gear set (GE, model 7763993), machined down to smallest possible dimensions. The photos should further clarify construction details.

The box-chassis is built out of 1/8" aluminum sheet bent in a 16 ton press. The aluminum strip, prior to bending, measures 2.75" x 8.5". The chassis cover is made of painted 20 gauge steel, as shown in the rear view photo.

The gear set (ratio about 1:5) is fastened to the front panel by two 6-32 Allen screws. To the back of the gear set is a subchassis ($\frac{1}{8}$ " aluminum) fastened with four 8-32 screws to the GE gear set; these screws serve also to hold the four hexagonal spacers that keep the GE set-up parallel to the front panel.

The slug tuning mechanism consists of two $\frac{1}{4}$ " round brass pillars, about $\frac{3}{4}$ " long fastened with 6-32 screws to the sub-chassis. It is of the utmost importance that these pillars be at exactly 90° to the sub-chassis, otherwise the tuning mechanism won't operate smoothly. A piece of $\frac{1}{8}$ " brass stock (about $0.7" \times 1.4"$) slides over the two pillars, being forced away from the front panel by two steel springs around the pillars. The tuning slug shaft (L_1) is threaded (6-32) to the center of the sliding brass bar stock; a 6-32 nut is installed between the brass bar and the slug to permit fastening the slug at any desired, permanent setting.

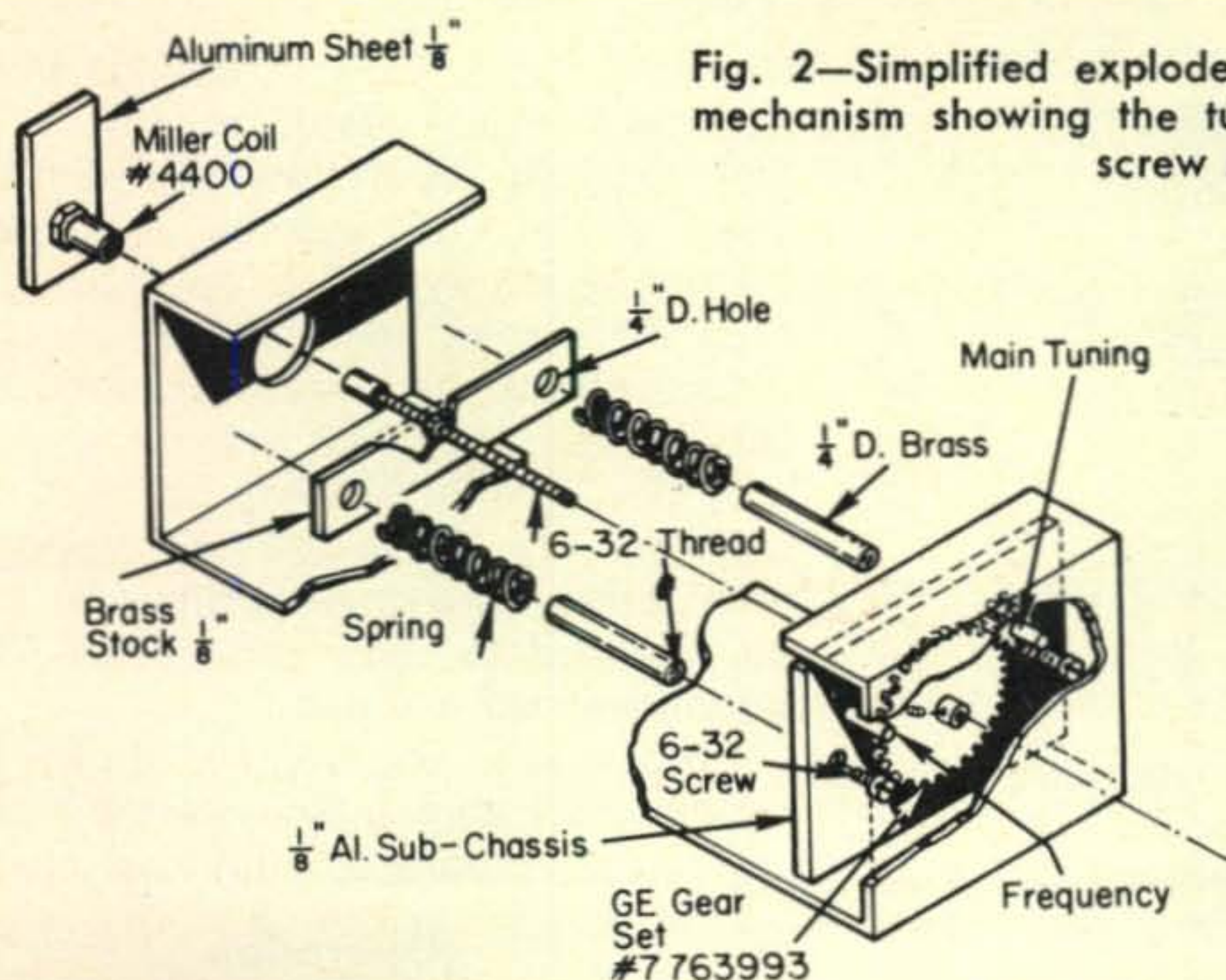


Fig. 2—Simplified exploded view of the v.f.o. drive mechanism showing the tuning inductor's slug lead-screw system.

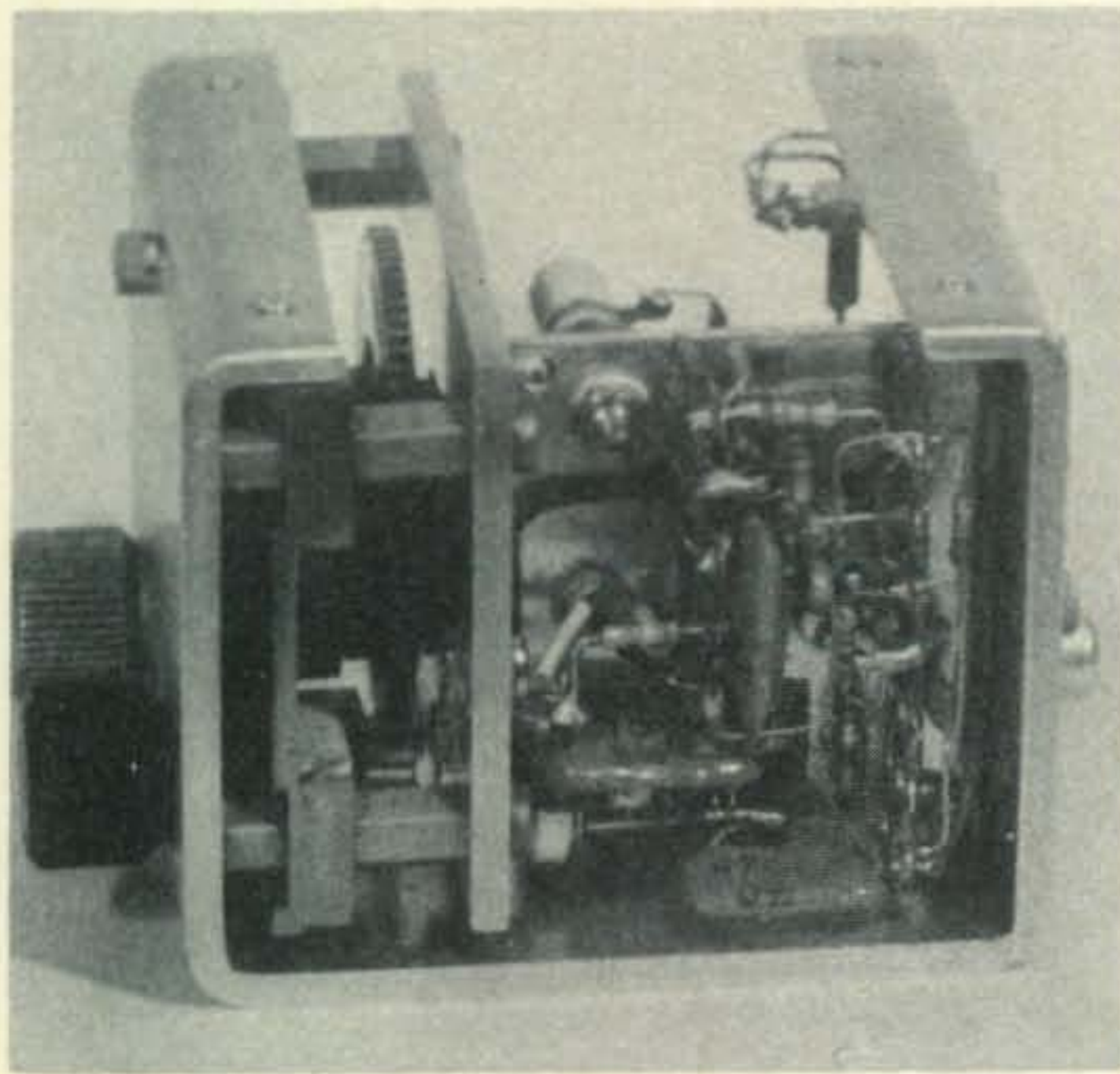
The tuning coil form itself is fastened to a piece of 1/8" aluminum sheet, which is in turn fastened to the rear of the cabinet by two 6-32 Allen screws; observe that the tuning coil is removable from the back of the v.f.o. box. This arrangement permits more compact construction and allows for coil removal and rewinding if necessary during adjustment. The shaft hole of the main gear is threaded 6-32 to fit the slug shaft of L_1 thus causing the slug to move in or out as the gear rotates. The threaded slug shaft is secured to the gear with set screws.

A 1/16" aluminum plate, fastened to the back of the cabinet holds the electronic components and L_2 , mounted at 90° to L_1 to minimize interaction caused by tuning. The position of L_2 , besides, permits easy frequency check-ups with a grid dip meter.

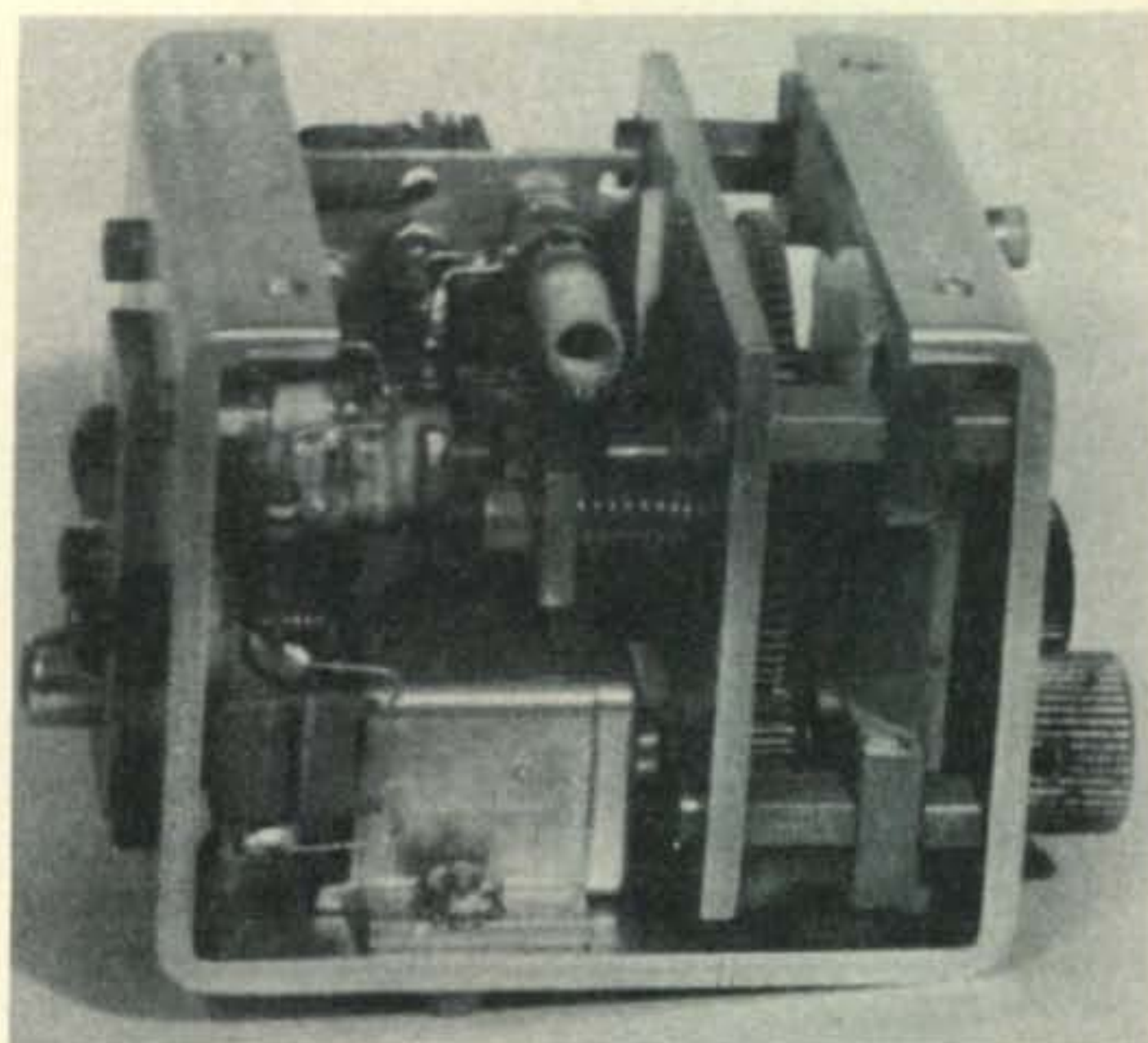
The counter is actuated directly from the tuning knob shaft via a miniature universal joint (see fig. 3). This adjustment is particularly difficult because of the small size and tolerances involved.

A tuning rate of 10 kc per revolution was chosen because:

1. It would allow the use of a small tuning knob, thus gaining in the overall size of the project.
2. It would permit direct coupling of the tuning shaft to the counter shaft without intermediate gears.



The v.f.o. is seen here from its "electronic" side. All wiring is made on a 1.5" x 2.2" x 1/16" aluminum plate, installed at a right angle to the 1/8" aluminum sub-chassis. The larger tuning-gear is visible to the left of the aluminum sub-chassis.



The v.f.o. as seen from the counter side, upside down. The tuning knob is visible at bottom right. To the right of the 1/8" aluminum sub-chassis is the tuning gears and the GE gear frame with corresponding hexagonal spacers. Above the counter the brass stock and one of the two pillars of the tuning mechanism are visible, together with its spring. L_1 is installed horizontally. L_2 is located at the top, at right angle to L_1 . Note the small clearances. Accurate component layout is necessary prior to handling miniature projects.

3. It would reduce nominal backlash to a minimum.

This last item may sound puzzling at first but by reducing the tuning rate to only 10 kc/revolution, the mechanical backlash of the gears (measured for the gears alone as being about 2°), brought in a tuning backlash of

$$\frac{2^\circ}{360^\circ} = \frac{1}{180} \text{ or } \frac{1 \times 10 \text{ kc}}{180} = 55 \text{ c.p.s.}$$

Obviously, if I were to use 20 kc/revolution the backlash would become 110 c.p.s., making s.s.b. operation less comfortable. These calculations assume no backlash in the tuning slug system, as the loading springs keep the system backlash-free.

Incidentally, two springs were used not only because they distribute more evenly the load over the brass bar, but also because they are not connected to rotating parts; prior tests with a single spring over the main shaft tended to show some hash when the system was being tuned.

Components location is shown in the photos and I suggest studying them carefully prior to attempting to duplicate this project.

Operation

The main tuning coil is wound with #22

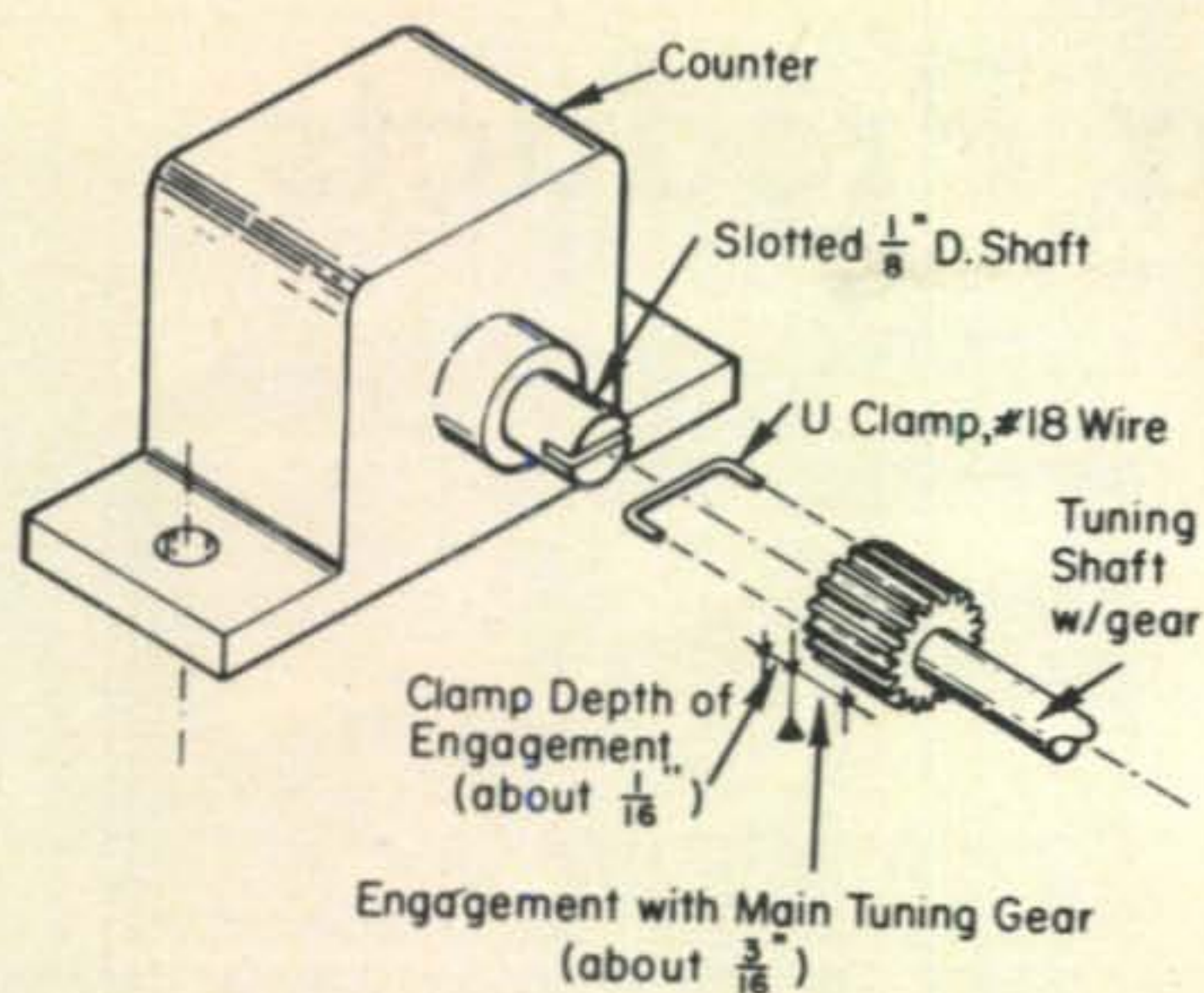


Fig. 3—Construction of universal joint between Veeder-Root counter and v.f.o. tuning shaft drive gear.

plastic insulated wire, installing at least 2 spacers (see fig. 4) at the cold end, between consecutive turns. The frequency of the coils should initially be checked with a grid dip meter taking the proper corrective measures (adding/removing L and/or adding/removing C); at start up, both the FREQUENCY control and the v.f.o. trimmer should be set up at mid-range. By the time a reasonable tracking with the counter is achieved, a finer adjustment is possible by properly rotating the plastic spacers of fig. 4 with the tip of the fingernail. These spacers adjust winding spacing and, if the coil has been wound tight enough, the system will have enough stability to permit further tests and checking.

I consider it of the utmost importance to design L_1 so that it can be easily removed from the v.f.o. in case rewinding is necessary; as it can be seen from the photos L_1 can be removed from the back of the box by simply loosening two Allen screws and unsoldering its terminals. This arrangement proved very helpful during alignment procedures. When the tracking is perfect, L_1

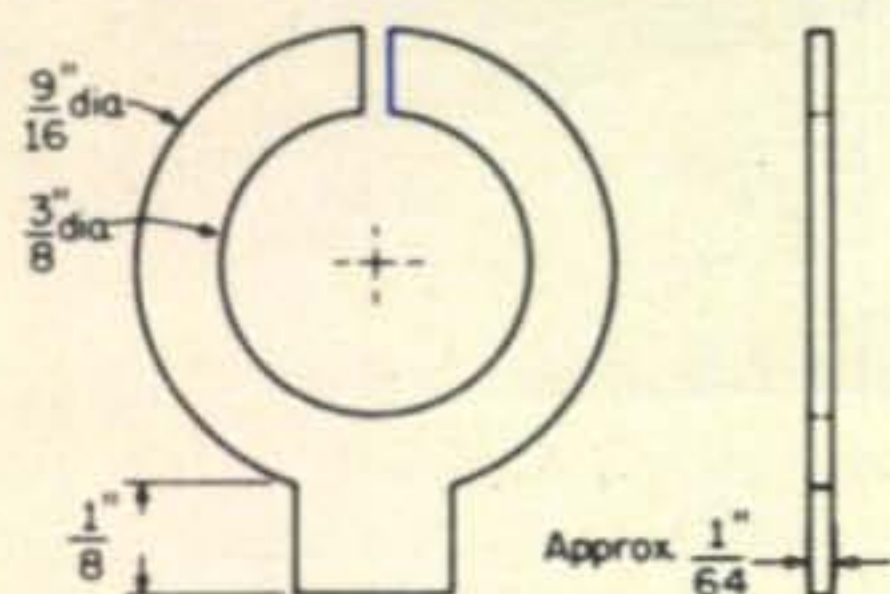


Fig. 4—Plastic spacer for adjusting turns spacing on L_1 for linear frequency vs. dial reading. At least two will be needed. See text under "Operation."

is set permanently in place with epoxy glue or any other suitable cement. A drop of enamel will set the nut locking on L_1 slug, as well as the winding and the slug of L_2 .

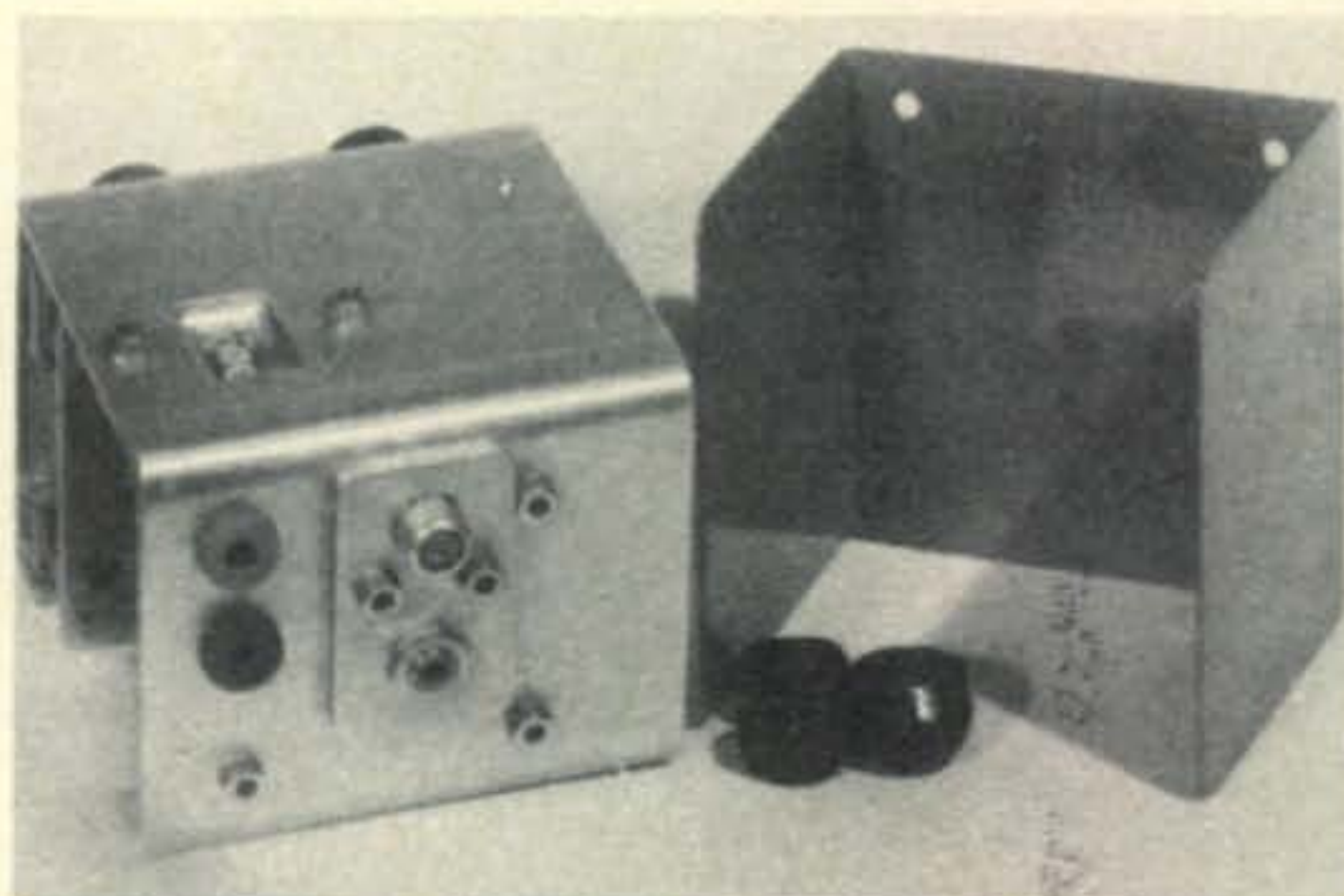
In case of duplication of this v.f.o. with different components, particular care should be taken to obtain best results avoiding "holes" or spurious responses both in the oscillator and in the buffer stage. In one of the early experimental set-ups, a secondary oscillation was present 203 kc below the main one and it took quite some work to get rid of it. In the versions described, however, no detectable spurious or tweets were recorded over a 600 kc range.

The overall current consumption of the v.f.o. is about 25 ma at 7.5-8.0 v., the largest share of this power being dissipated in the voltage regulation system, as I tend to operate my zeners well loaded to assure good regulation for wide power supply voltage fluctuations. The actual v.f.o. + buffer consumption (at 6.2 v., regulated) is about 6 ma.

The weight of the whole unit is about 14 oz. Its frequency stability has not been determined in numbers because of lack of adequate instrumentation. The following observations, however, should be sufficiently indicative of its performance:

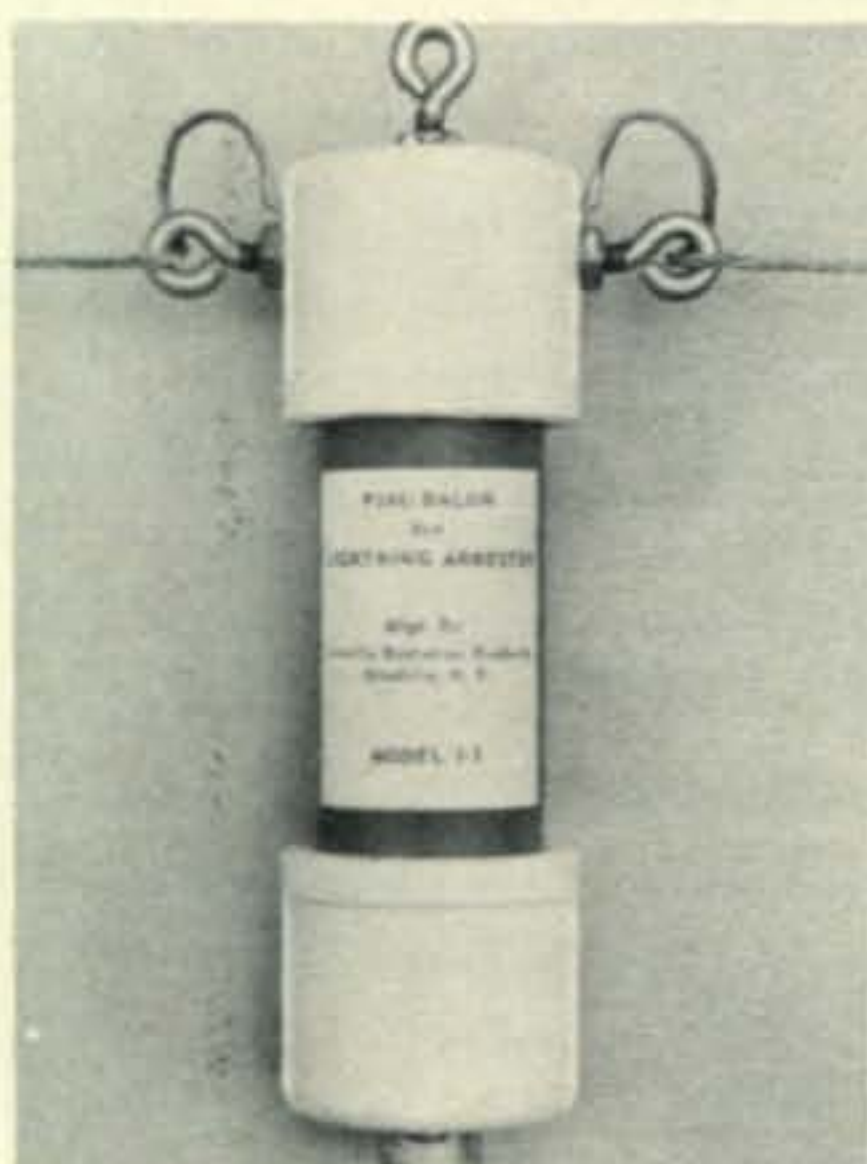
1. Using the v.f.o. third harmonic to increase sensitivity of the test, beating with WWV at 15,000 kc, zero beat periods in excess of 30 minutes were recorded.
2. Voltage variations (from initial 7.5 v.)

[Continued on Page 90]



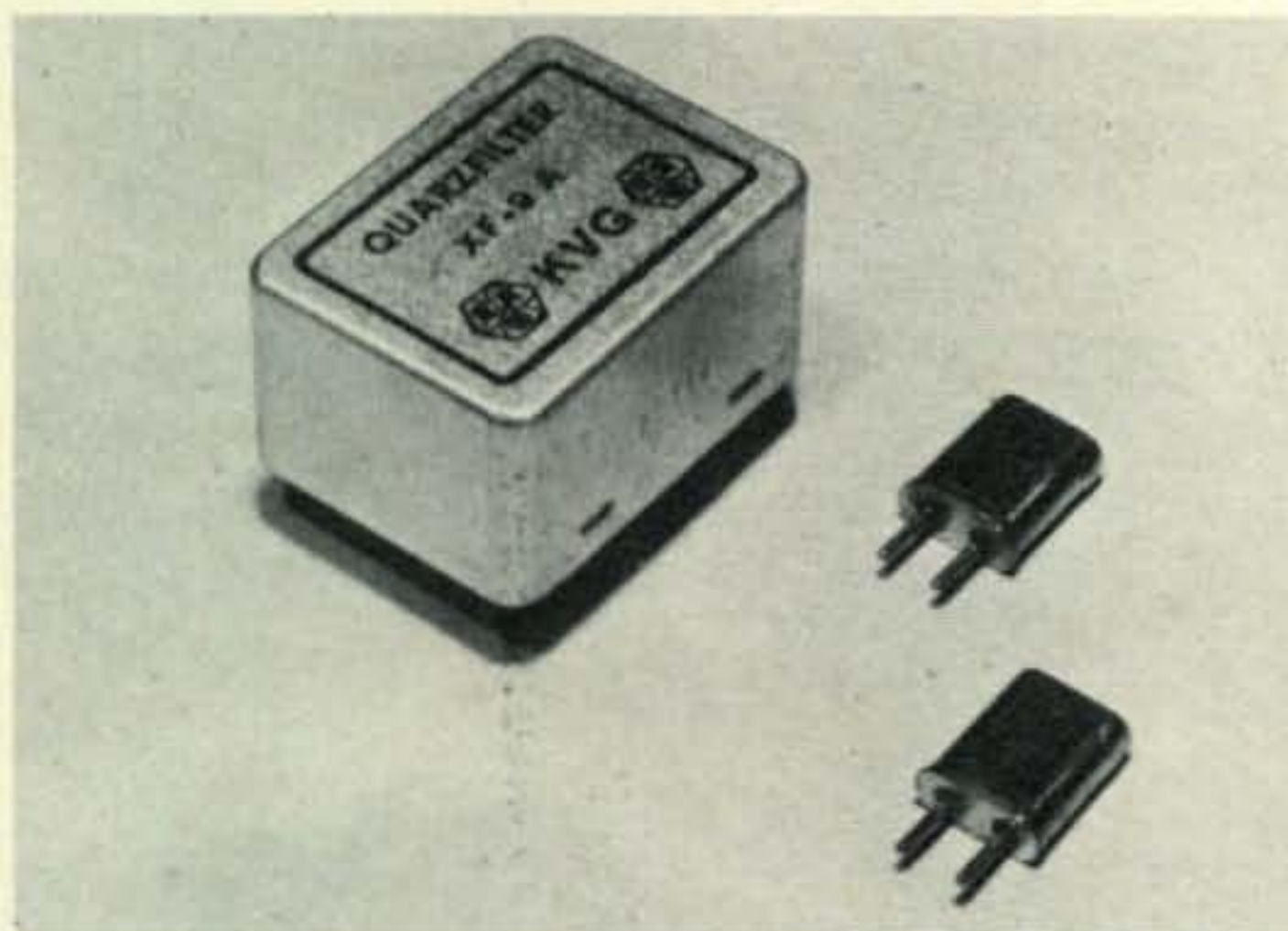
Backview. The counter is visible at top left; right below the counter (on the back panel) are the two power jacks. At the center of the back panel is the 1/8" aluminum plate holding L_1 ; above L_1 is the RCA phone jack used for the r.f. output from the v.f.o. The 20 gauge steel cabinet is at right with its four rubber feet which also fasten the cabinet to the aluminum structure.

New Amateur Products



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The KVG line of high-quality high-performance 9 and 10.7 mc crystal filters and matched oscillator crystals for s.s.b., f.m., a.m., and c.w. are now offered in the U. S. and Canada through Spectrum International. There are six 9 mc models available ranging in bandwidths .5, 2.4, 2.5, 3.75, 5.0 and 12.0 mc. They are designated the XF-9 series. Four 10.7 mc filters are also available in the XF-107 series with bandwidths of 12 kc, 15, 30, and 36 kc for f.m. channel separation of 20, 25, 50 and 50 kc respectively. Matching miniature HC25/U oscillator crystals for the filters are available at \$2.75 each. The filters range in price from \$21.95 to 32.45. For complete specifications on these crystal filters and crystals write to Spectrum International, Box 87, Topsfield, Mass. 01983 or circle 4 on page 102.



Allied A-2517 80-10 meter Transceiver

The Allied A-2517 s.s.b./c.w. transceiver features dual conversion and covers 3.5 to 29.7 mc in seven bandswitched ranges. It includes a built-in solid state v.f.o. accurate to 1 kc on all bands. Other features are: sidetone, vox, p.t.t., fast or slow a.g.c., built in 25 kc calibrator; receiver incremental tuning plus/minus 3 kc without touching main tuning. Power input is 160 watts at 3.5 to 21 mc; 120 watts at 28 mc. The A-2517 is priced at \$400.00 and is 7 1/4" X 13" X 13 5/8". A matching a.c. supply and speaker, Model A-2518, is available at \$99.95. For those who want a separate v.f.o., the Model A-2519 is available at \$89.95. For complete details, write to Allied Radio Shack, 100 N. Western Ave., Chicago, Illinois 60680 or circle 3 on page 102.



RCA Alkaline Battery Charger

New from RCA is a low-cost battery charger designed exclusively for alkaline rechargeable batteries. The unit, designated the BC-16, will charge two pairs of AA, C and/or D cells simultaneously, overnight. The small unit has a self-storing line cord for its 120 v. input. The BC-16 sells for \$8.95 through RCA distributors and dealers.

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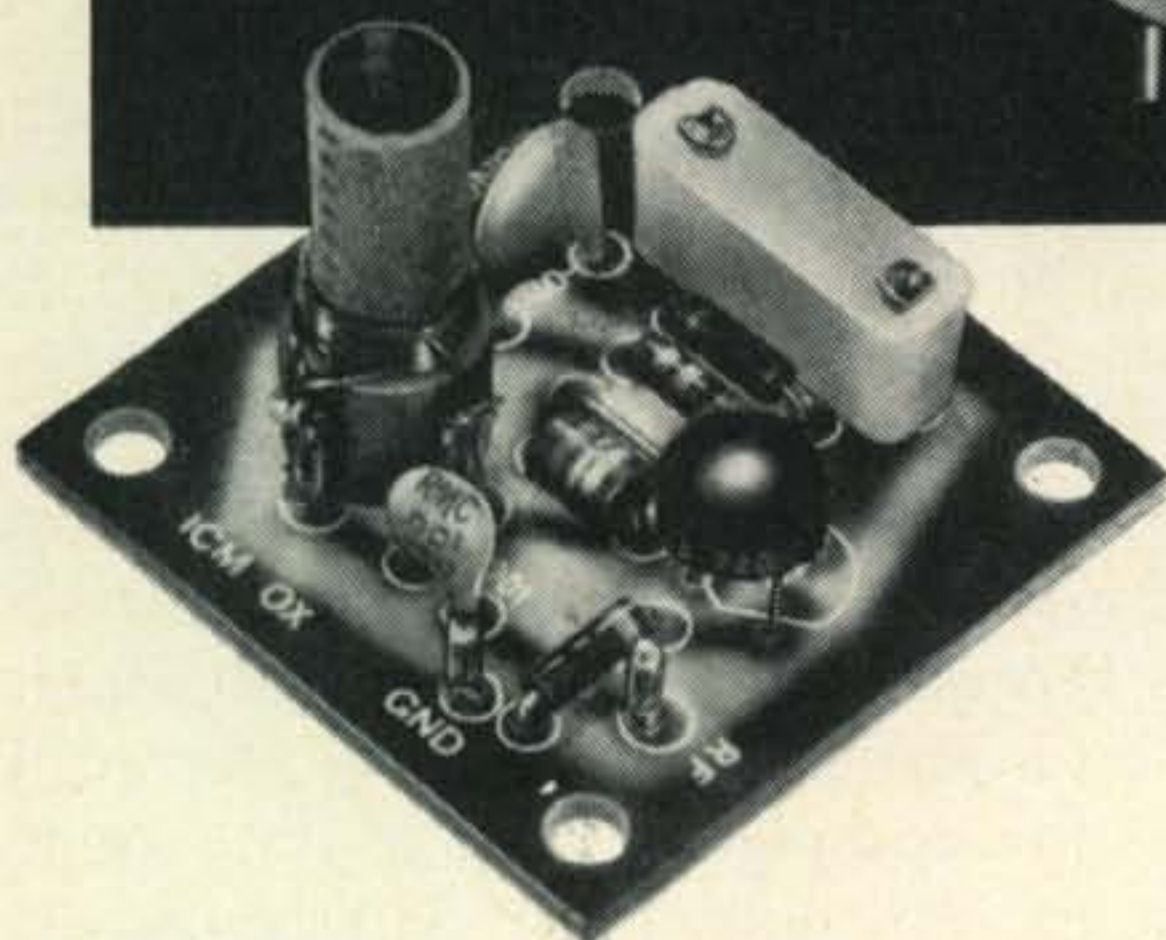
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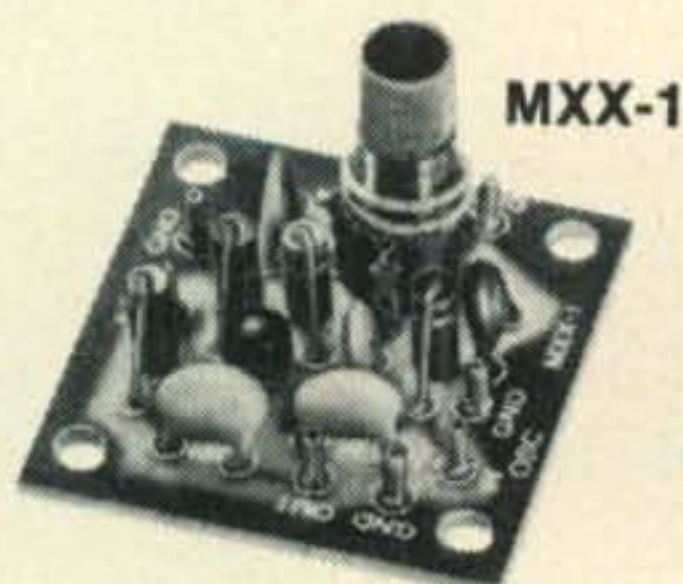
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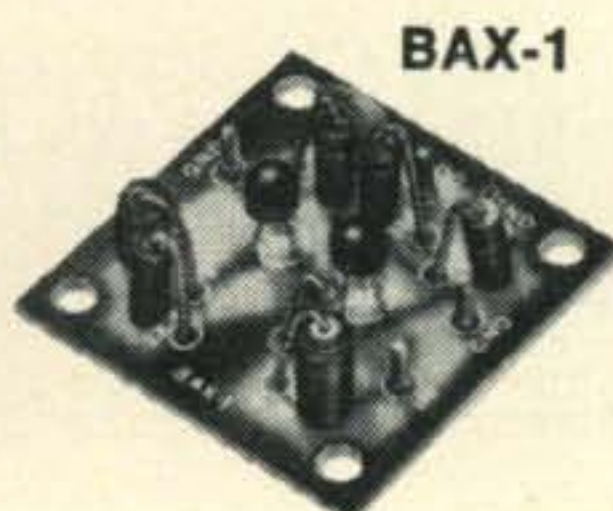
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CQ Reviews:

The Collins 30L-1 Linear Amplifier

BY WILFRED M. SCHERER,* W2AEF

SOME months ago *CQ* reviewed the Collins S-Line, even though this gear has been of at least 10-year's standing. Judging from the readership response, the review was well accepted as a source of interesting and useful information for those already in possession of or still in contemplation of obtaining this equipment.

It is therefore felt justified that at this time we take a look at a companion unit for the S-Line, the 30L-1 Linear Amplifier, especially since it also includes some advantageous features not found in other linears. Although it carries only a 1000-watt p.e.p.-input rating, it actually has somewhat higher power capabilities plus performance which is such that hardly allows much more effectiveness to be gained by the use of a legally-operated 2000-watt p.e.p.-input job.

General

The 30L-1 Linear Amplifier is a table-top unit designed to operate at 1000 watts p.e.p. input on s.s.b. or 1000 watts d.c. input on c.w. with a nominal drive power of 70 watts. Coverage is provided for the 3.5-28 mc amateur bands. Operation also may be had on other ranges in the 3.4-30 mc spectrum by readjustment of the input circuits. A built-in power supply is included in the unit.

Technical Details

Four parallel-connected 811-A triodes are employed functioning in class AB with a cathode-driven essentially grounded-grid type configuration. The fundamental circuitry used may already be quite familiar, inasmuch as the basic arrangement has been adapted to a number of other amplifiers now on the market; nevertheless, the setup will be recapped here for those who may have missed other descriptions.

R.f. drive is applied to the tube cathodes (filaments) through fix-tuned and broadbanded Pi-networks switched for each band. Unlike a passive input, these tuned circuits ensure better efficiency, less distortion and a more desirable load for the exciter. The filaments are maintained at r.f. above ground by the use of bifilar-wound chokes.

Loading Setup

A bandswitched Pi-network at the output has adjustable loading for matching to 25-100 ohm resistive loads or those with an impedance representing an s.w.r. to the amplifier within 2:1 (related to 50 ohms).

In this respect, one of the features exclusive to the 30L-1 is that proper adjustment of the loading is indicated by a "center-zero" reading at the TUNE position of the panel meter. This occurs when balance takes place in a bridge circuit to which the meter is connected. A sample of the cathode-drive voltage and an r.f. voltage, appearing at the tube grids (the grids are slightly above r.f. ground), are applied to opposite legs of the bridge as shown at fig. 1.

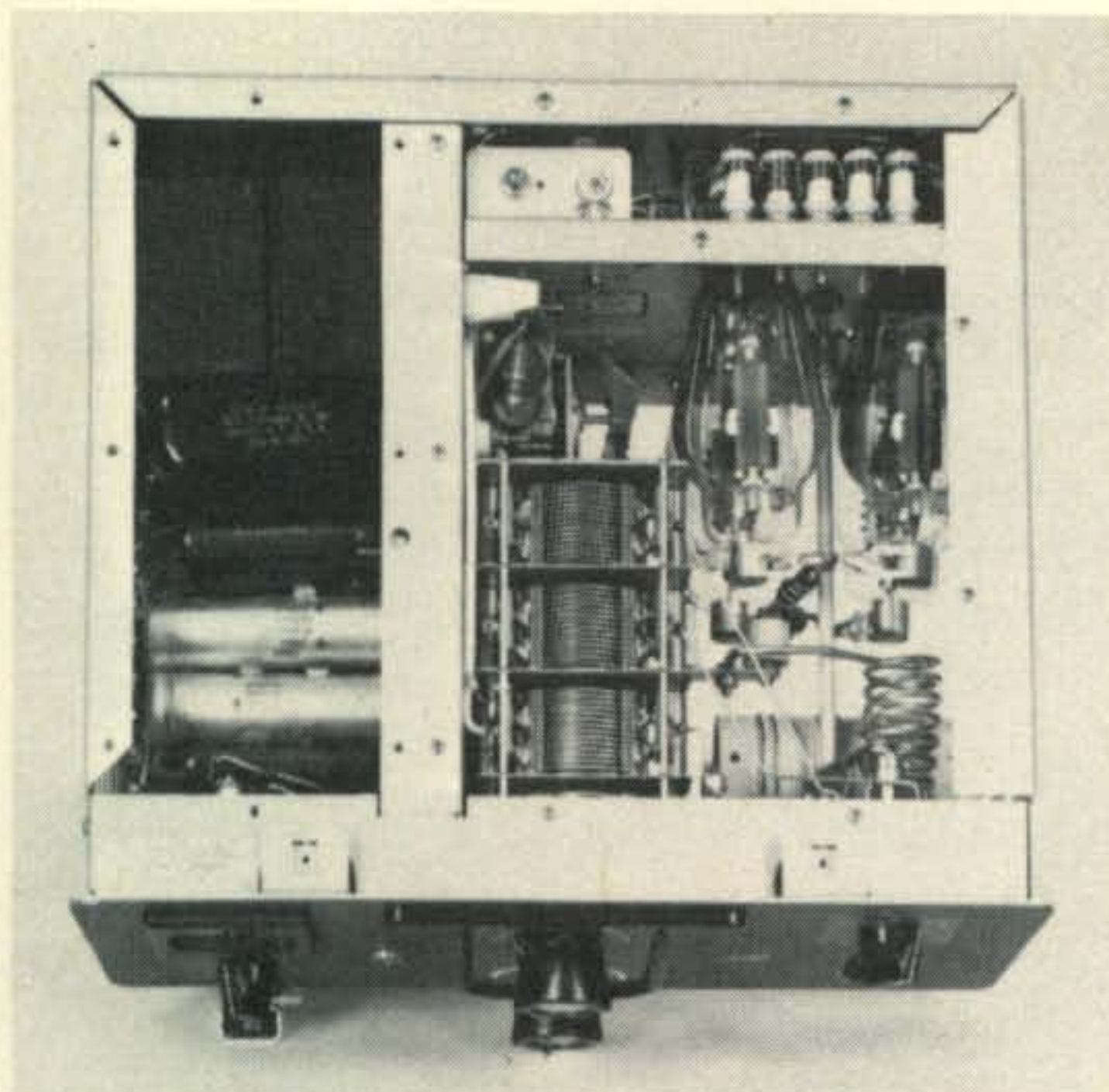
When the loading is correct, these voltages are such that the bridge is balanced. The cor-



The Collins 30L-1 linear amplifier.

*Technical Director, *CQ*.

1" *CQ* Reviews: The Collins S-Line," *CQ*, December 1969, p. 49.



Top view of the 30L-1 with the individual covers removed from the power-supply section (left) and the amplifier compartment (right). Each section has its own h.v. grounding switch. The r.f. input inductors at upper right are adjustable from the rear of the unit.

rect ratio of these sampling voltages, required for balance, is initially set by a balance control adjusted under conditions of proper loading.

An advantage gained by the system is that amplifier adjustment can be accomplished quickly and accurately with a minimum juggling of controls. In addition, and of greater import, is that the right tuneup indication is obtained both with low- and high-drive levels. Optimum adjustment thus may be made with

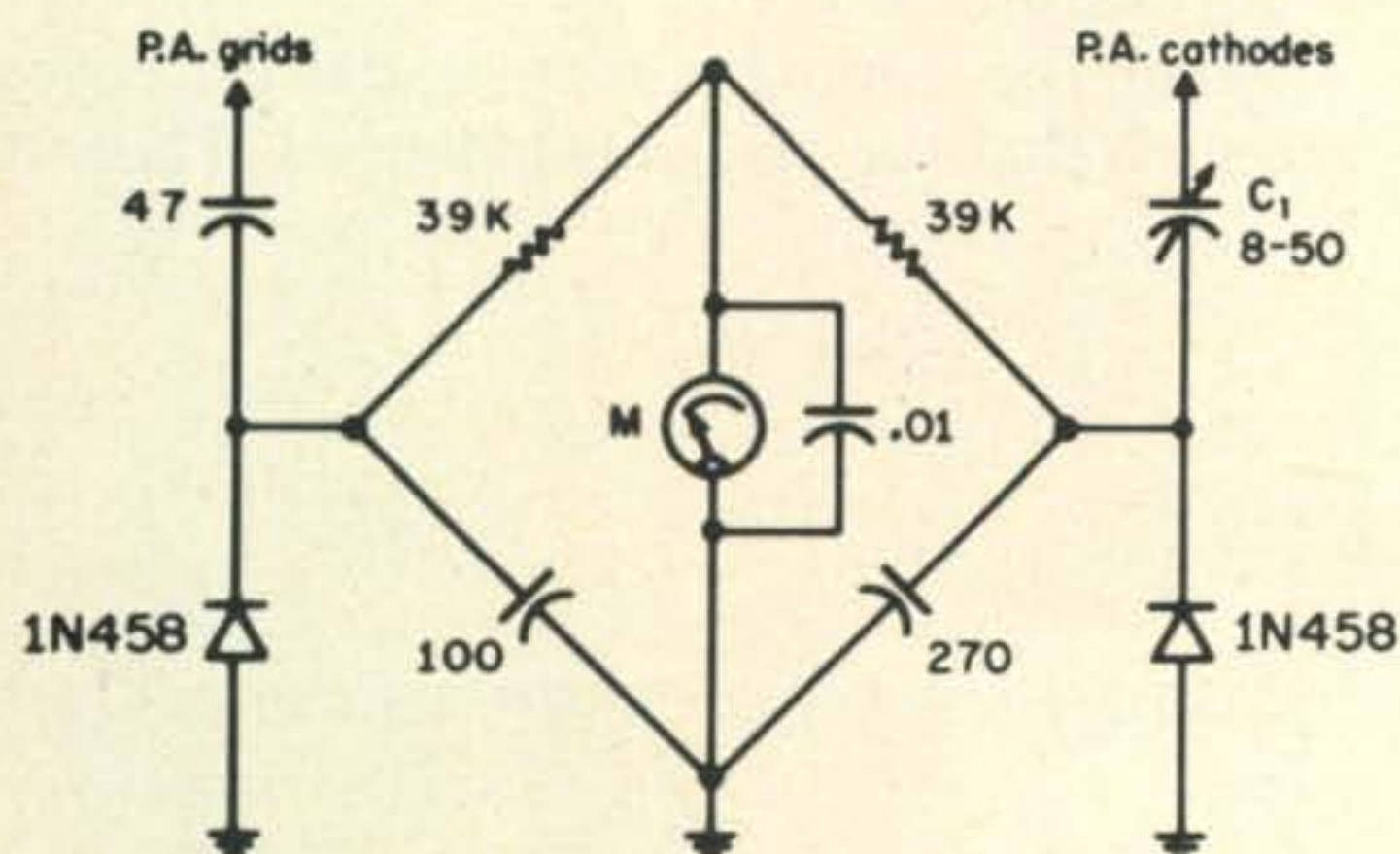


Fig. 1—Bridge circuit used for the tuning indicator in the 30L-1. Balance control C_1 is initially adjusted so that when the amplifier is properly tuned and loaded, the ratio of the rectified r.f. voltages from the tube grids and cathodes applied to the bridge are such that the bridge is balanced and the meter rests at a "zero-center" position.

low drive, reducing the possibility of tube or component damage during off-resonance or other adverse conditions, as might otherwise result with tuneup at higher-power levels under such conditions. Then too, if it is necessary to conduct tuneup into an antenna (instead of into a dummy load), such tuneup may be done with low drive and with the transmitting-power input maintained within the legal restriction of 1000 watts.² The amplifier will still be properly tuned with subsequent normal drive levels and higher-power operation.

The tuneup indicator also serves as a monitor of optimum adjustment and linearity during transmissions, as the meter pointer will remain fixed at zero and not fluctuate during modulation under proper loading and linear operation.³

Besides being utilized as a tuneup indicator, the meter may be switched to also read plate potential or current.

A.L.C.

A sample of the r.f. voltage at the tube grids also is rectified by a silicon diode to provide a negative d.c. potential for a.l.c. This potential is fed back to a jack for routing to the a.l.c.-operated stages in the exciter. Fast-attack and slow-release time constants are employed.

A.l.c. operation thus depends on an *r.f. voltage*, rather than on an a.f. component produced by an initial degree of overdrive. This in itself is an advantage, but an additional feature in the 30L-1 is that the a.l.c. threshold may be set by a variable reverse bias on the a.l.c. rectifier. This is obtained from the plate-supply bleeder.

The threshold may then be adjusted to cause the a.l.c. to take hold at the r.f.-input voltage just *below* the overdrive point. The threshold normally is set for operation with the 32S—and KWM—series of Collins exciters. As pointed out later, even without the a.l.c., it was found impossible to overdrive the 30L-1 with this gear or other units with output in the 100-watt area; but where an exciter has higher power capabilities, the a.l.c. threshold may be reset for holding down the peak output for operation with

²See "Legal Power with Grounded-Grid Amplifiers," Q&A Colum, *CQ*, June 1970, p. 75.

³Meter movement also may be indicative of maladjustment of the bridge-balance control for tune-meter setup. See remarks under Operation and Performance.

such gear. In other cases, it may be set to prevent overdrive of the exciter itself.

Power Supply

The built-in power supply may be operated from either a 115 or a 230 v.a.c., 50-400 c.p.s. source, depending on whether two primary windings on the transformer are connected in parallel (for 115 v.) or in series (for 230 v.).

Three secondary windings individually provide 6.3 v.a.c. for the tube filaments and meter lamp, power for a -170 v.d.c. supply to provide blocking or operating bias along with energizing voltage for the changeover relay, and power for a plate supply of 1800 v.d.c. A full-wave voltage-doubling circuit is used for the latter with 8 silicon diodes in each leg. A reverse-voltage-equalizing capacitor installed across each diode provides protection against damage by transients. Filtering and dynamic regulation is obtained with six 100 mf 450V. electrolytic capacitors connected in series with 26-watt wire-wound voltage-equalizing resistors shunted across each one. These resistors also form a bleeder. The bias supply employs a half-wave rectifier with one silicon diode.

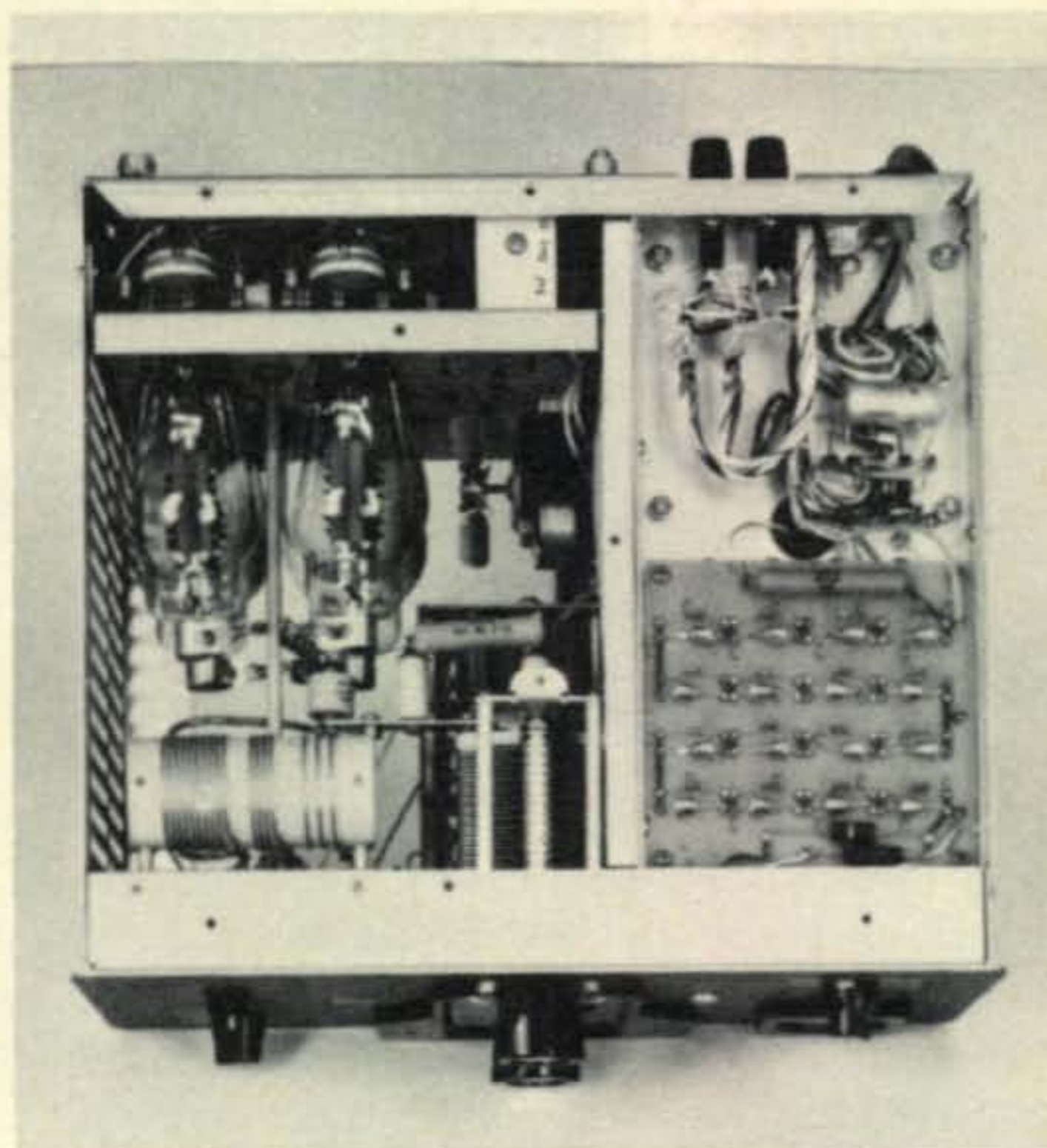
An extremely quiet blower for forced-air cooling around the tubes is connected across one of the transformer primaries and thus operates at 115 v.a.c. Operation at a line frequency other than 50/60 c.p.s. requires an auxiliary 60 c.p.s. supply for the blower motor.

Overload protection is provided by an 8-ampere fuse in one leg of each primary. A fuse in the filament center-tap return protects the tubes from excessive plate current. This fuse consists of a one-inch length of #28 wire.

A safety measure for operating personnel is the incorporation of three mechanical grounding switches. These are located in the power-supply and amplifier compartments. Whenever the removable panels are taken off the particular enclosure, the related switch automatically grounds the high-voltage supply line and instantaneously discharges the filter capacitors or short circuits any high voltage otherwise present.

Transfer Circuits

A d.p.d.t. transfer relay is arranged so that the antenna is automatically connected as needed for straight-through exciter-only and receive or for linear-amplifier operation.



Bottom view of the 30L-1. Additional shielding, besides the cabinet, is provided by a large perforated cover that has been removed. One of the h.v. grounding switches is located in the power supply section at the right.

Either type operation may be instantly selected simply by turning the amplifier's power switch on or off. Immediate operation is augmented by the use of the silicon diodes in the power supply and the instantaneous heating of the 811-A filaments which go on or off with the power switch as does the blower motor.

During standby or receiving periods, the full bias voltage goes through the relay coil which is in series with the bias-supply line to the tube grids. This completely cuts off the tubes, eliminating tube noise and any plate load on the power supply. When the relay is energized (by the exciter control-relay contacts) for amplifier operation, a large voltage drop across its coil and a section of a resistive voltage divider reduces the negative potential applied to the tube grids to a few volts for operating bias.

Construction

The 30L-1 embodies the same high-quality construction, workmanship and appearance that is typical of Collins gear as reported in the earlier review. It requires little space on the operating desk, being compacted into an overall size of $6\frac{9}{16}$ " $\times$ $14\frac{3}{4}$ " $\times$ $13\frac{3}{4}$ " (H.W.D.). The weight of the unit is 38 lbs.

[Continued on Page 90]

An Efficient Multiband Loop Antenna

BY MALCOM M. BIBBY,* GW3NJY/W8

Take one quad-type element, turn horizontally, feed at the midpoint of one side with coax and produce a simple antenna with real and effective gain over a dipole.

WHILE recently attempting to produce a self resonant loop antenna for use on the l.f. bands the antenna system described below was devised. Although too large for the l.f. bands it could be useful on the h.f. bands and also for general listening purposes on the v.h.f. bands. The antenna's main attraction is that harmonic operation is possible while still maintaining a low input impedance. The antenna is ideally built in the

*1400 Seneca Blvd., Apt. 105, Broadview Heights, Ohio, 44147

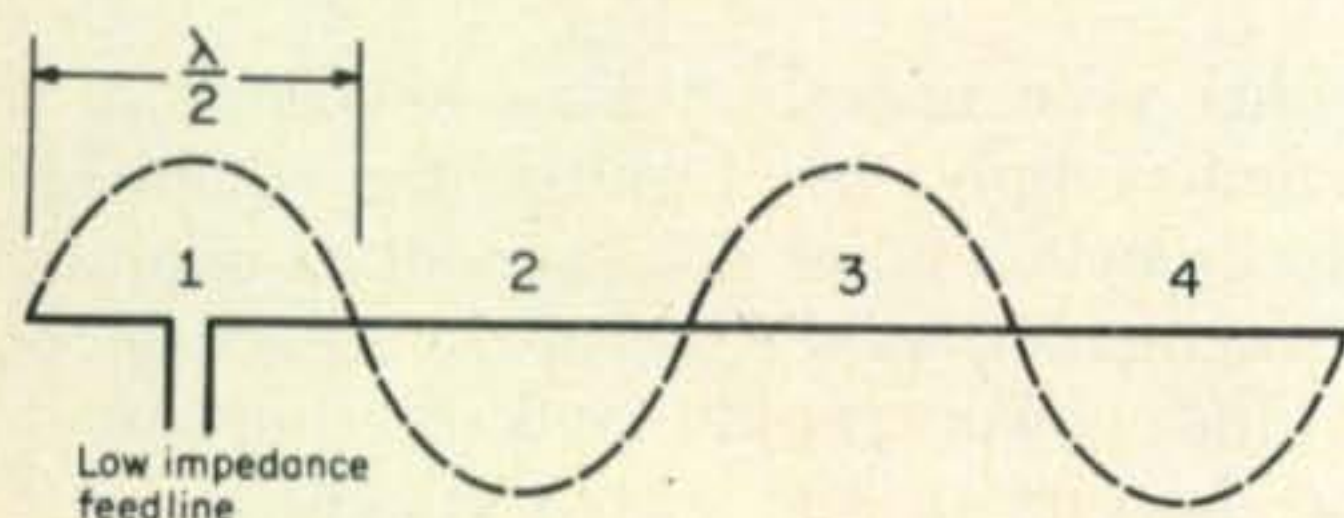


Fig. 1—Current distribution on a two wavelength antenna fed $1/4$ wavelength from one end.

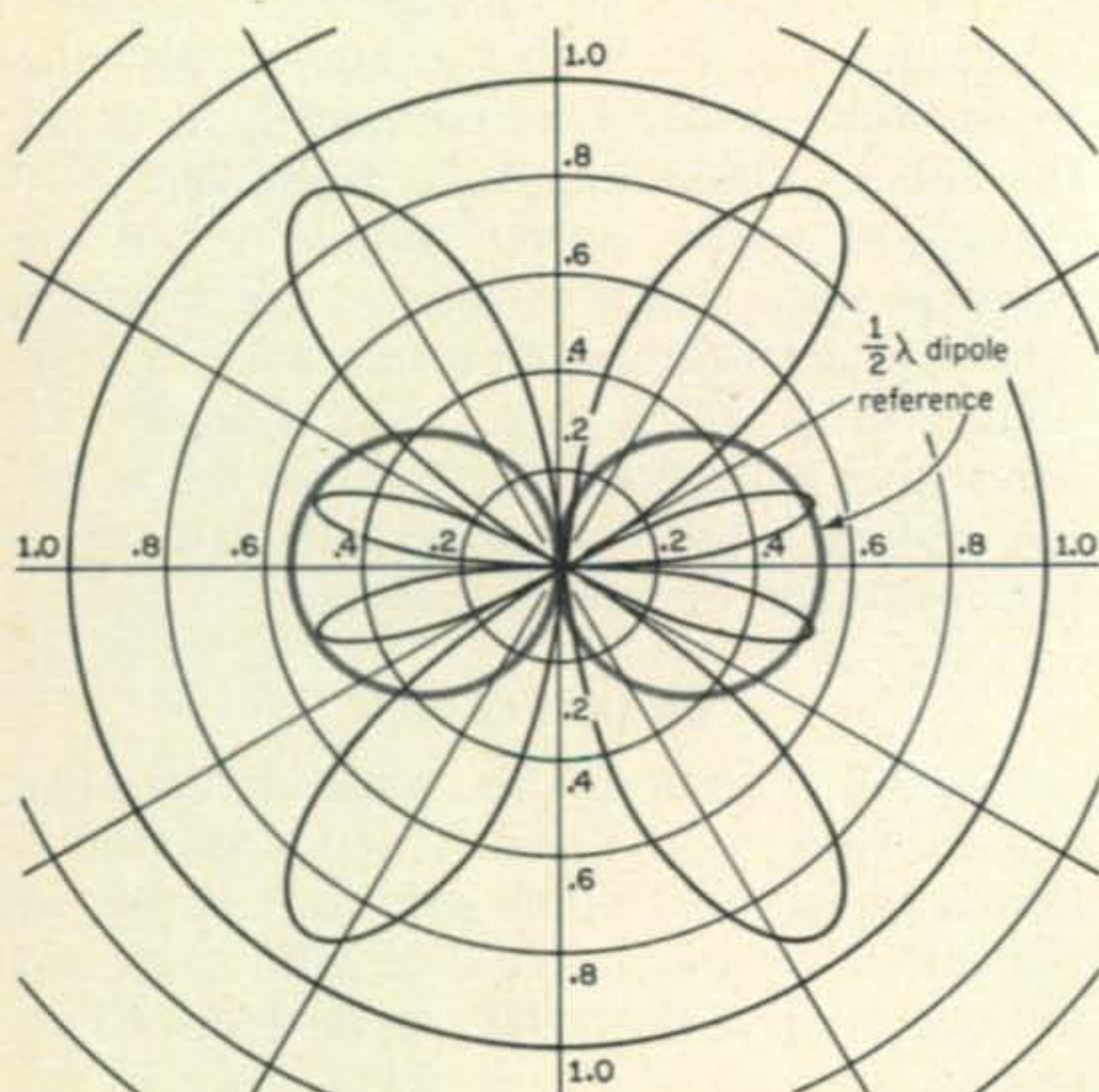


Fig. 2—Radiation pattern of the 2 wavelength antenna shown in fig. 1.

form of a square and fed at the center of one side. It is horizontally polarized.

Theory

Consider the two wavelength antenna of fig. 1. The dotted line shows the current distribution both in magnitude and phase. Sections 1 and 3 are in phase with each other as are sections 2 and 4 but the latter are also 180° out of phase with the first and third sections. This has the effect of producing the radiation pattern shown in fig. 2. When the antenna is bent into a loop the current distributes itself as shown in fig. 3. Although the currents in opposite pairs appear 180° out of phase they are also spaced 180° apart which brings the radiation back in phase. The radiation pattern for such a loop fed in the center of one side is shown in fig. 4. The feed point impedance is low, i.e., suitable for coaxial cable impedances. The 1968 ARRL *Handbook* (p. 361) indicates a gain of approximately 4db can be expected for a pair of half-wave antennas spaced a half-wavelength apart and fed 180° out of phase. Compared with a dipole the

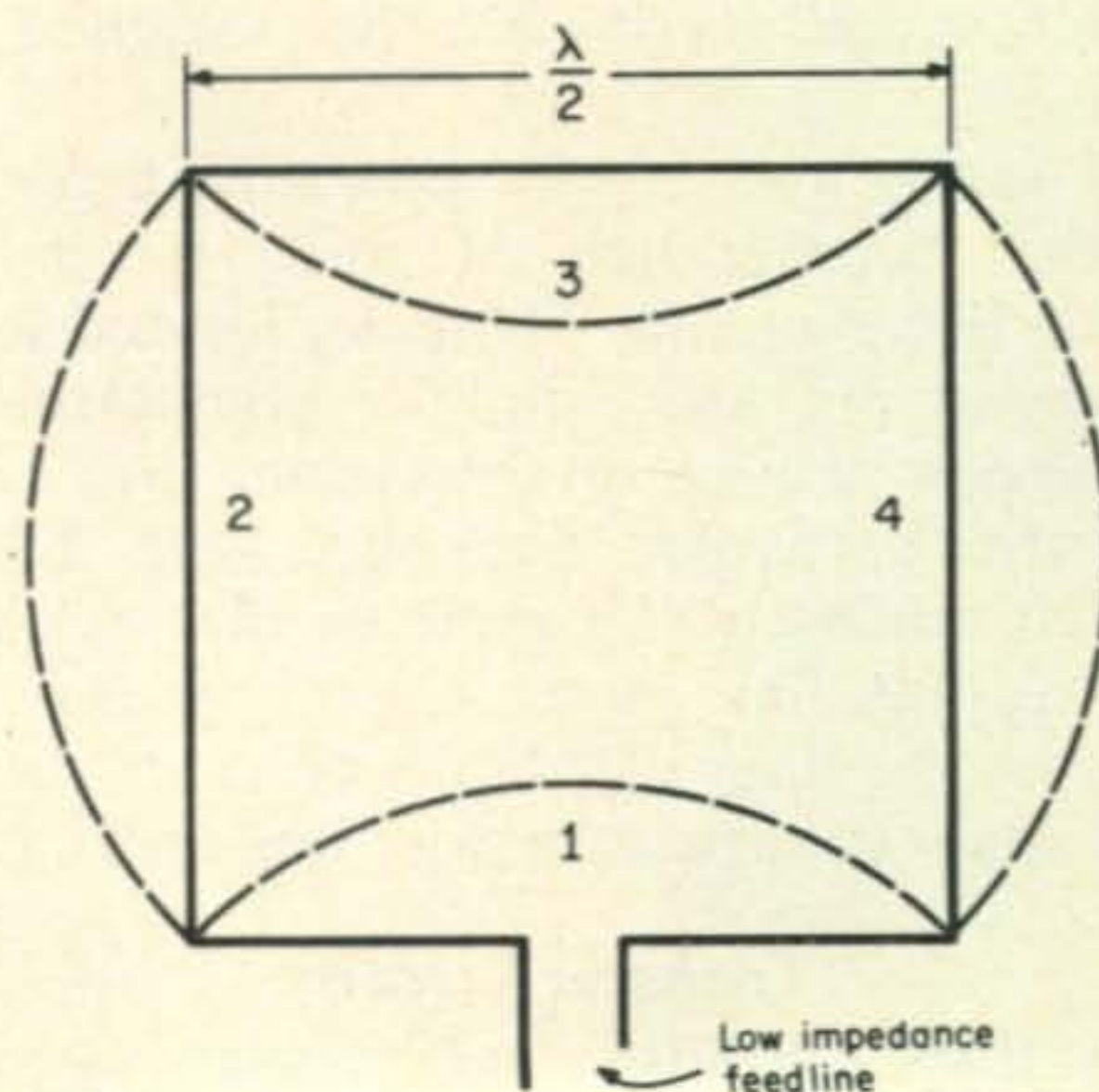


Fig. 3—Current distribution of a two wavelength antenna bent to form a continuous loop.

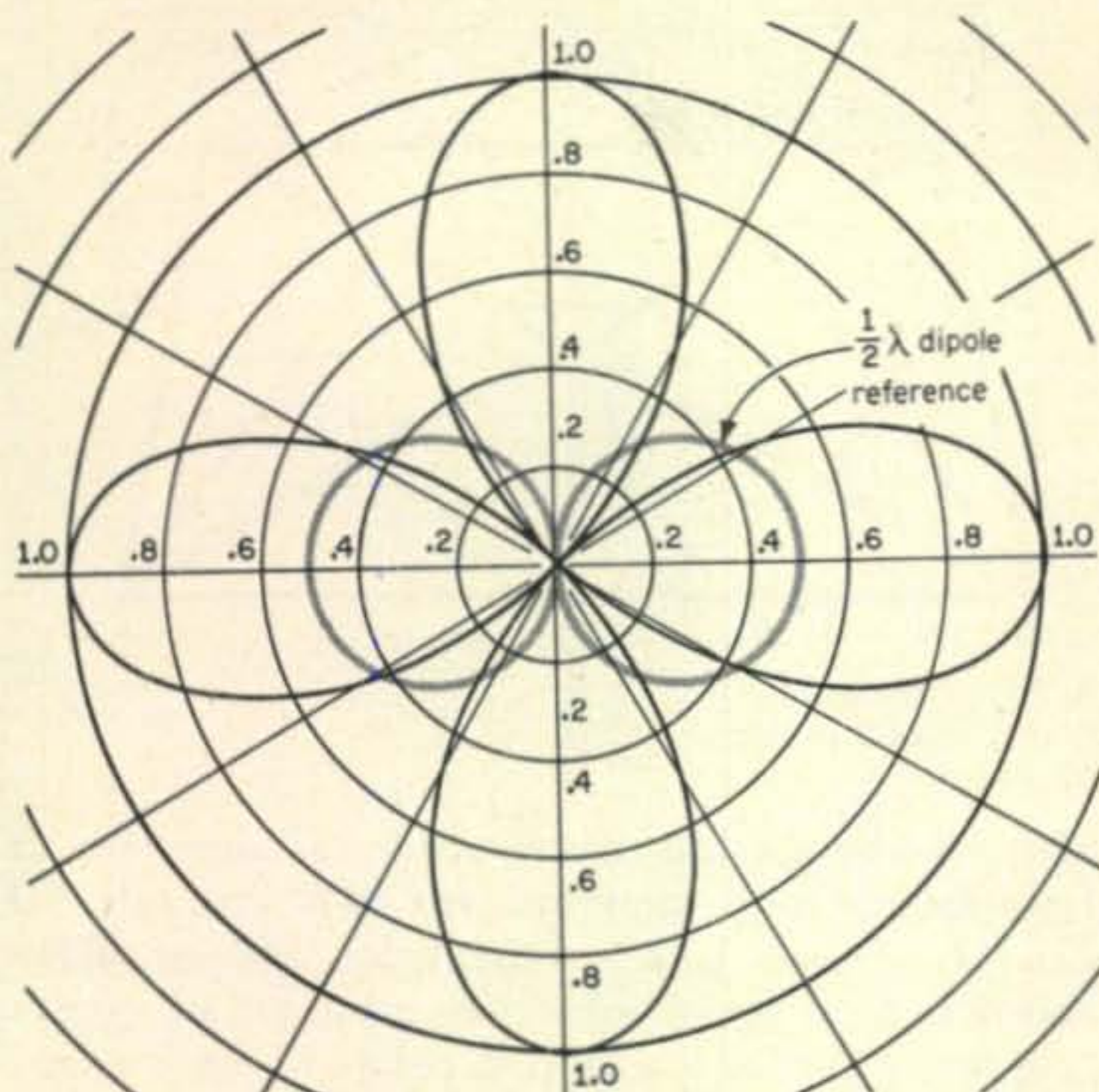


Fig. 4—Radiation pattern of the two wavelength loop antenna shown in fig. 3.

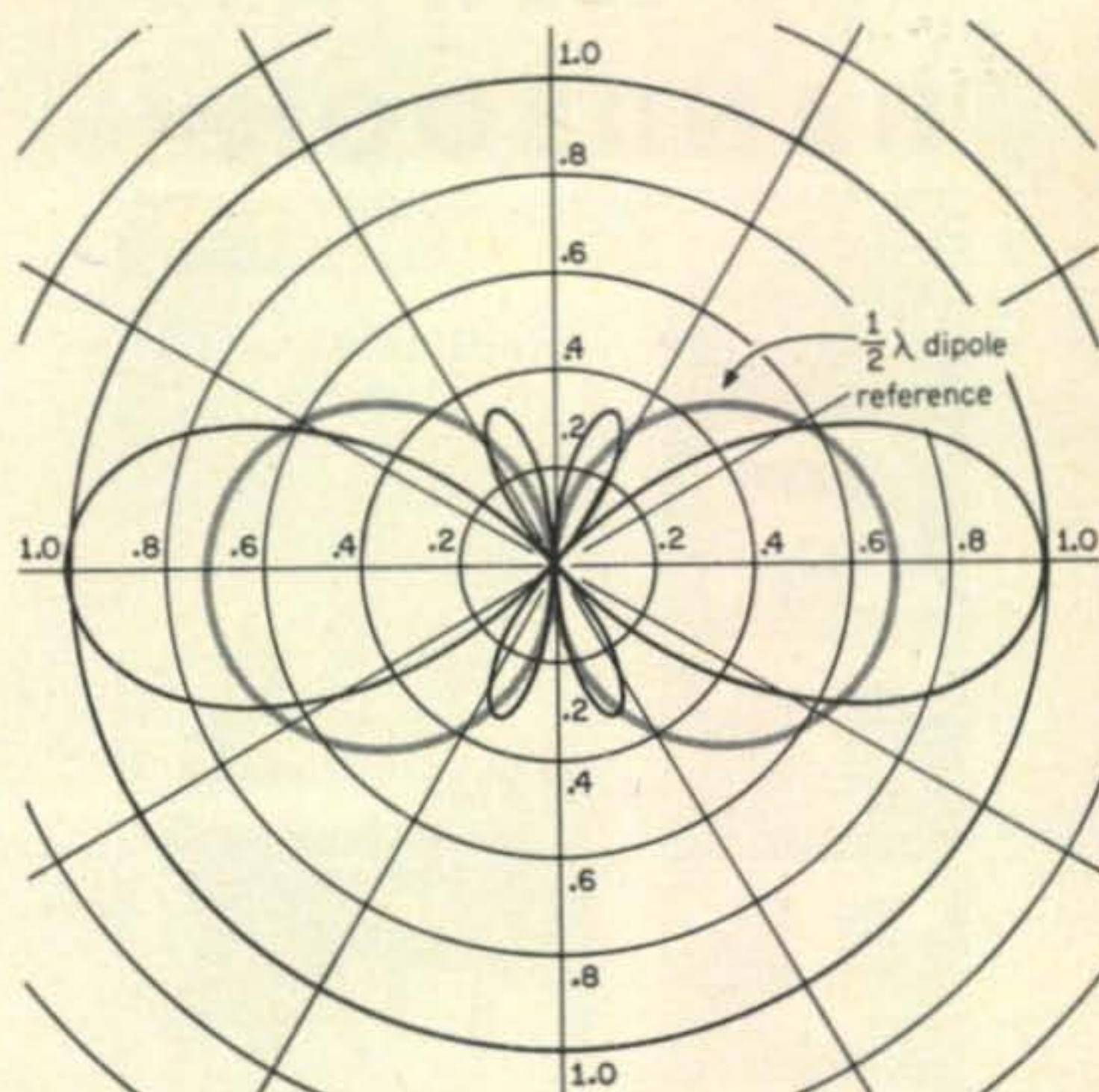


Fig. 6—Radiation pattern of a three wavelength loop.

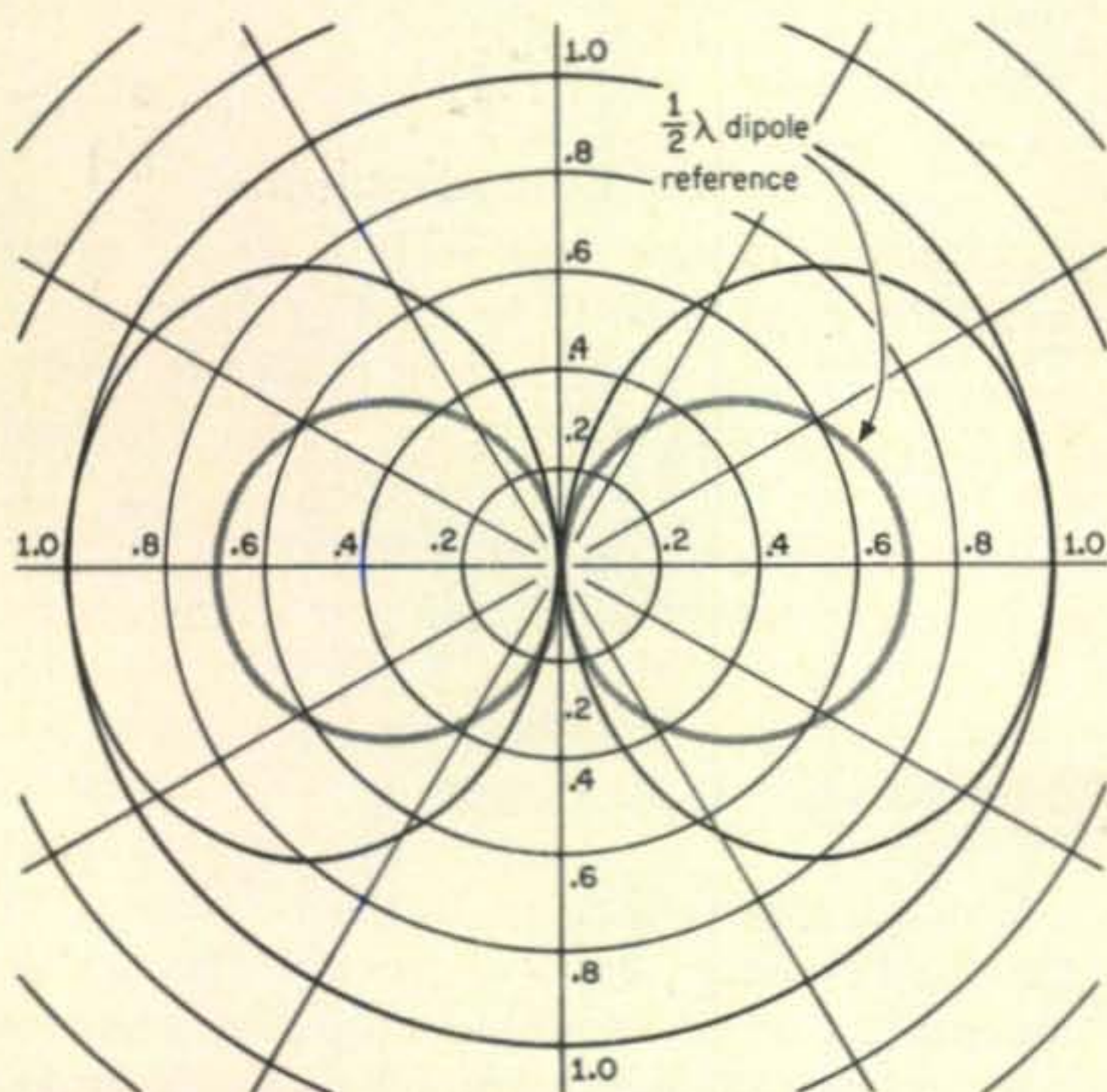


Fig. 5—A one wavelength loop antenna will produce this nominal radiation pattern.

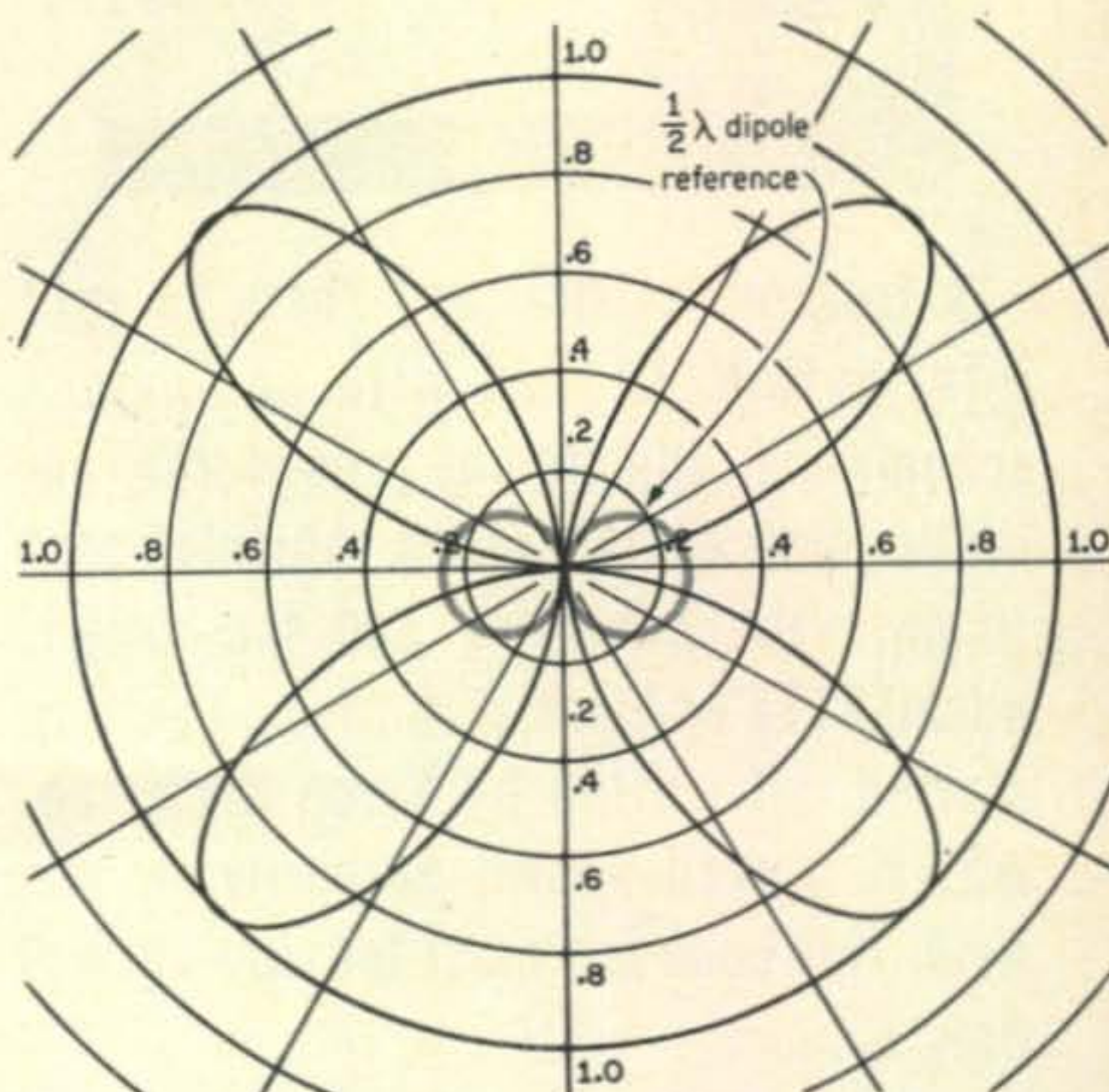


Fig. 7—Expected radiation pattern of a four wavelength loop antenna.

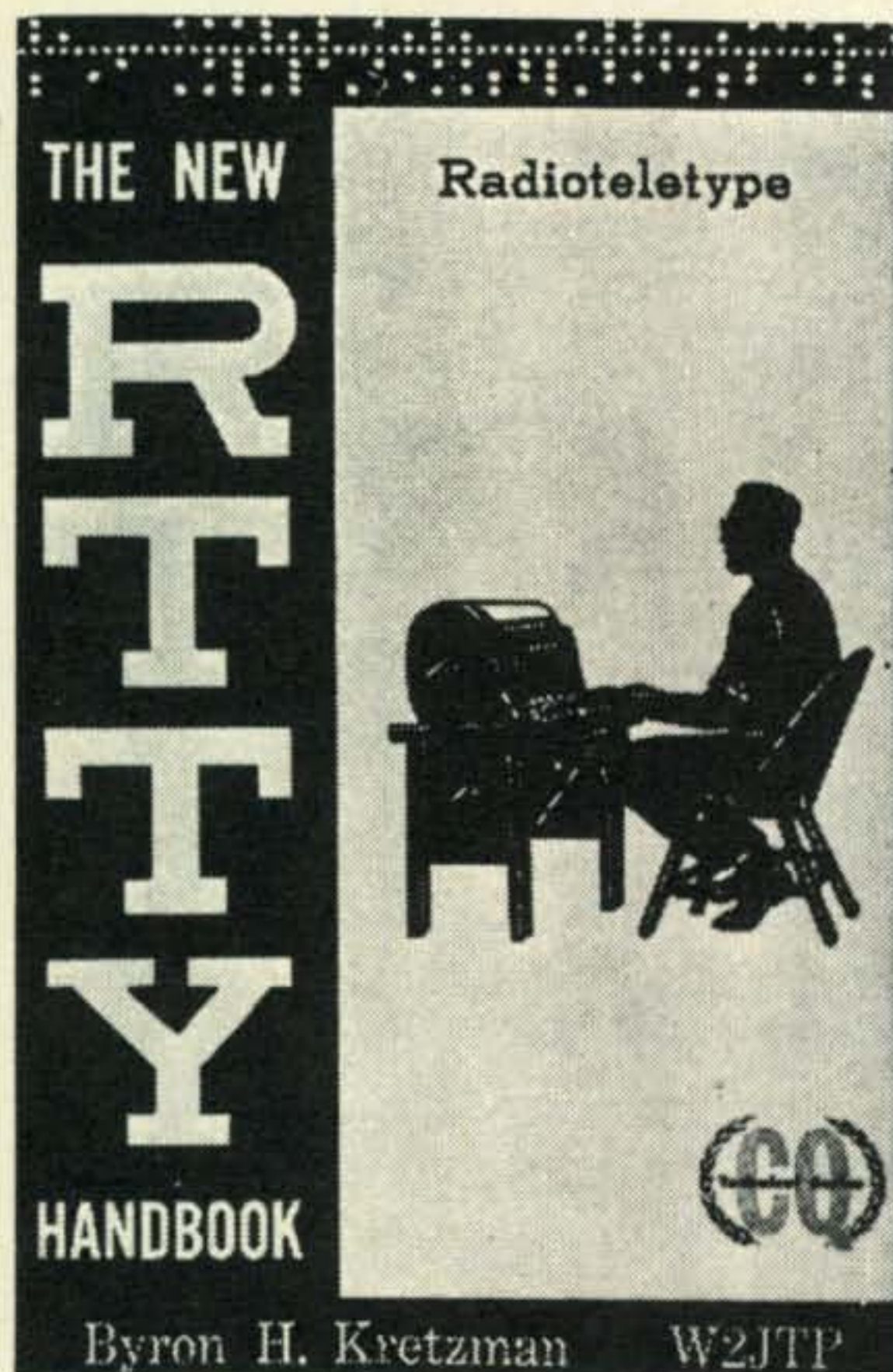
angle of elevation will be lower. For a fixed antenna the gain and low angle of radiation in a number of directions make it very attractive.

Multiband Operation

If the sides of the antenna loop are made one quarter wavelength the feed point remains low impedance. In fact this is identical to the driven element of the well known quad antenna—only mounted horizontally. The horizontal radiation pattern is shown in fig. 5. If the sides of the square are made three quarter wavelength or a full wavelength then

the antenna still maintains a low feed impedance. The respective horizontal radiation patterns are shown in figs. 6 and 7. The patterns of figs. 5 and 7 were derived ignoring the effects of radiation from the corners (none occurs for figs. 4 and 6), and are intended more as indications of what to expect. In practice the gain of the main lobe will probably be reduced and the depth of the nulls also reduced. The radiation patterns are plotted as electric field patterns and not power patterns. A dipole pattern is shown for reference purposes. In figs. 4, 5, 6 and 7

"THE NEW RTTY HANDBOOK"



A treasury of vital and "hard to get" information. Loaded with equipment schematics, adjustment procedures, operating procedures, etc. A valuable asset to both the beginning and the experienced RTTY'er. Special section on getting started, all written by Byron Kretzman, W2JTP, a well known authority in the field. This book is a must for your library! Only \$3.95.

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CQ Magazine

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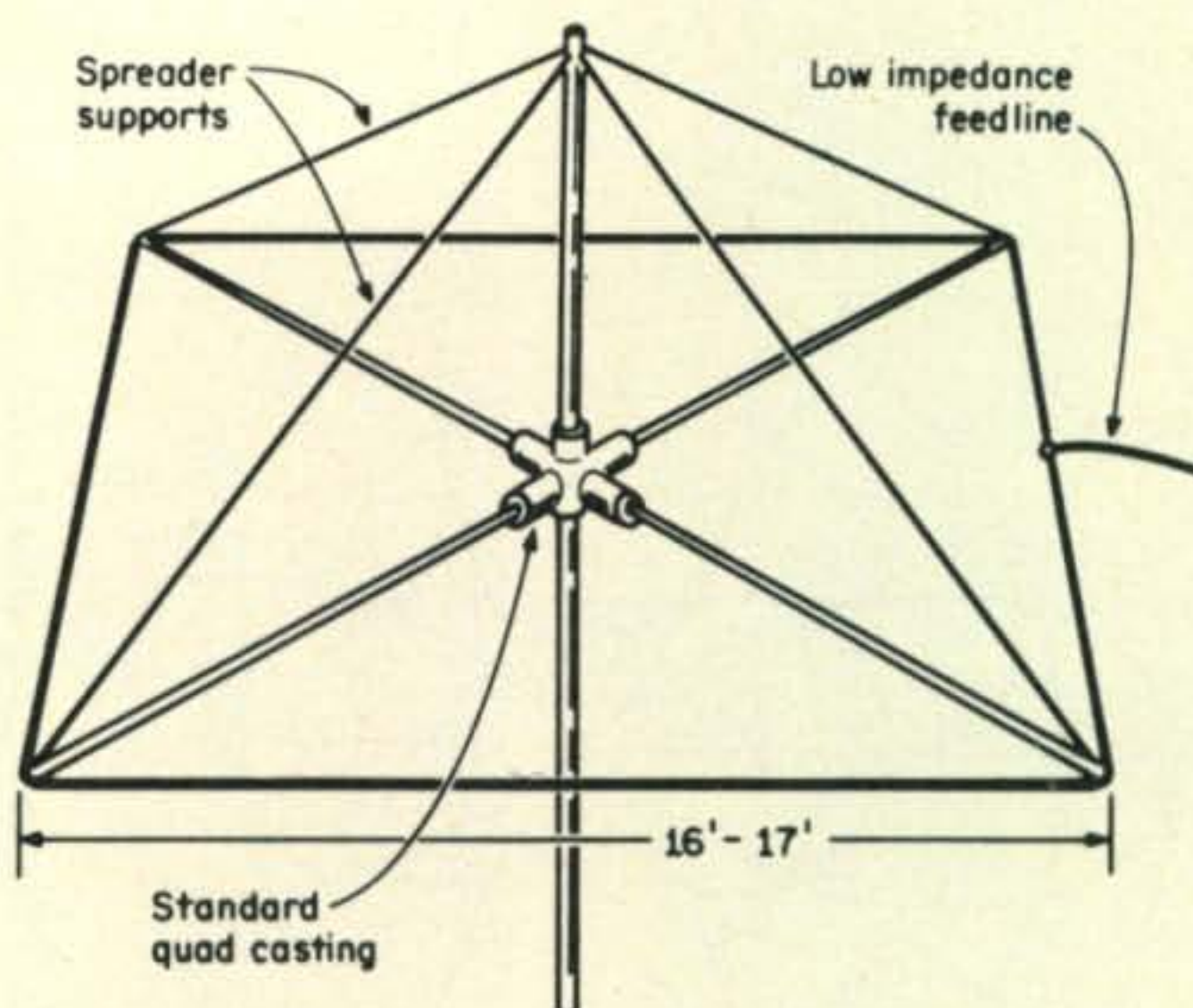


Fig. 8—Suggested construction scheme for a multiband loop antenna for 40 through 10 meters. Nylon guy strings from one or more corners to a secure object nearby will eliminate the tendency for the loop to rotate in the breeze.

the dipole pattern refers to the pattern that would be obtained if a single half-wave antenna was placed at the feed point and fed with the same power.

Practical Considerations

Unless someone has four trees or other supports conveniently located at the corners of a square and spaced 66 ft. or 134 ft. apart, then the antenna will not justify the erection of four supports for operation on the l.f. bands. However, on 20, 15 and 10 meters, it becomes practical to think in terms of the structure sketched in fig. 8. Here horizontal spider elements (bamboo or fiber-glass) are used to support the antenna. The positions of support will be at high impedance so that adequate precautions in terms of insulation should be taken at these points. The whole assembly can be mounted atop some sturdy pole or mast. The antenna needs a low impedance balanced feed system for which a balun and coaxial cable would be suitable.

Conclusion

A 33 ft. x 33 ft. antenna was used by the author at a recent QTH. This antenna was located in the roof space and fed with RG-58/U and a balun. On 40 meters c.w., contacts were regularly made with Europe, VK/ZL and S. America. Unfortunately a good s.w.r. meter was not available at the time so that the s.w.r. was not known on the four bands (40, 20, 15 and 10m.) A coaxial cable impedance of 75 ohms or 100 ohms would probably have provided a better match than the 52 ohm RG-58/U however. ■

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All you add is mike, speaker
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Or ask Information Operator for Varian Electron Tube and Device Group.



So we moved ahead of them.

Rules: 1970 CQ World-Wide DX Contest

Phone: October 24-25 & C.W.: November 28-29
Starts 0000 GMT Sat. Ends 2400 GMT Sun.

I. OBJECTIVE: For amateurs around the world to contact other amateurs in as many different zones and countries as they can in the contest period.

II. BANDS: All amateur bands, 10 thru 160 meters.

III. TYPE OF COMPETITION: 1. Single Operator. Single Band & All Band.

2. Multi-Operator (all band operation only).

a. Single Transmitter (only one transmitter and one band permitted during a 15 min. period).

b. Multi Transmitter (no limit to transmitters but only one signal per band permitted).

IV. NUMBER EXCHANGE: PHONE: RS report plus zone (i.e.: 5705). C.W.: RST report plus zone (i.e.: 57905).

V. MULTIPLIER: Two types of multiplier will be used.

1. A multiplier of one (1) for each different zone contacted on each band.

2. A multiplier of one (1) for each different country contacted on each band.

Stations are permitted to contact their own country and zone for multiplier credit. The CQ Zone Map, DXCC country list, WAE country list and WAC boundaries are standards.

VI. POINTS: 1. Contacts between stations on different continents are worth three (3) points.

2. Contacts between stations on the same continent but different countries, one (1) point. (*Exception:* For North American stations *only*, contacts between stations within the North American continental boundaries count two (2) points).

3. Contacts between stations in the same country are permitted for zone or country multiplier credit but have zero (0) point value.

VII. SCORING: All stations: The final score is the result of the total QSO points multiplied by the sum of your zone and country multiplier.

Example: 1000 QSO points $\times$ 100 multiplier (30 Zones + 70 Countries) = 100,000 (final score)

VIII. AWARDS: First place certificates will be awarded in each category listed under Sec. III in every participating country and in each call

area of the United States, Canada, Australia and Asiatic USSR.

All scores will be published. To be eligible for an award a Single Operator station must show a minimum of 12 hours of operation. Multi-operator stations must operate a minimum of 24 hours. A single-band log is eligible for a single-band award *only*. If a log contains more than one band it will be judged as an all-band entry, unless specified otherwise.

In countries or sections where the returns justify, 2nd and 3rd place awards will be made.

All certificates will be issued to the licensee of the station used.

IX. TROPHIES & PLAQUES: Handsome trophy awards will be made to the highest scoring stations in the following categories.

Single Operator, Single Band Trophy Donors

1. World—Phone (Dr. Harold Megibow, K2-HLB Memorial—North Jersey DX Assoc.)

2. World—C.W. (Earl Lucas, W2JT Memorial—North Jersey DX Assoc.)

3. Canada—Phone (Gene Krehbiel, VE6TP)

4. Carib./C.A.—Phone (Brazil DXers)

Single Operator, All Band Trophy Donors

6. World—Phone (Bill Leonard, W2SKE)

7. World—C.W. (Larry LeKashman, W9IOP)

8. USA—Phone (Potomac Valley Radio Club)

9. USA—C.W. (Frankford Radio Club)

10. Canada—Phone (Jack Baldwin, VE3BS)

11. Europe—Phone (W4BVV Operators)

12. Europe—C.W. (W3MSK Operators)

13. Carib./C.A.—Phone (Harold Fox, W3AA)

14. Carib./C.A.—C.W. (Harold Fox, W3AA)

15. Africa—Phone (Gordon Marshall, W6RR)

16. Africa—C.W. (Gordon Marshall, W6RR)

17. Asia—Phone (Japan CQ Magazine)

18. Asia—C.W. (Japan CQ Magazine)

19. Oceania—Phone (Jack Chalk, KC6EJ)

20. Oceania—C.W. (Bill Myers, KH6GPQ)

Multi-Operator, Single Trans. Trophy Donors

21. World—Phone (John Knight, W6YY)

22. World—C.W. (Dr. Anthony Susen, W3-AOH)

23. Canada—Phone (Calgary A.R.A.)

Multi-Operator, Multi Trans. Trophy Donors

24. World—Phone (Radio Club Venezolano)

25. World—C.W. (Hazard Reeves, K2GL)

Contest Expedition Trophy Donors

26. World—Phone (Stuart Meyer, W2GHK)

27. World—C.W. (Dr. Donald Miller, W9-WNV)

CO WORLD-WIDE DX CONTEST CO

CALL OK1XX Log Per 7 M. Band CZECHOSLOVAKIA
(Use separate log for each band.) PHONE ☐ CW ☒

DATE	TIME	STATION	SERIAL NUMBER		Zone No.	COUNTRY	Points
			Sent	Received			
26	0857	DL6RN	59916	59916	14	GERMANY	1
	58	DL3BY	569	52818			1
	59	DM7L	579	52919			1
	0109	DJ9AG	579	52919			1
	12	OK1MB	589	59915	15	CZECHOSLOVAKIA	0
	15	OK1P	599	59915			1
	18	PA8BC	599	52919		HOLLAND	1
	19	OK1LY	569	52919		ENGLAND	1
	0208	OK1Y	579	52919			1
	14	AA8A	579	52919			1
	29	PA8BC	569	59919		(DUP.)	0
	49	OK1Y	589	52919			1
	0322	OK1MB	579	58919			1
	36	HA8RA	579	52919	19	ASIATIC SEA	3
	55	OK1MB	579	56719		SCOTLAND	1
	0916	DM7L	579	58919			1
	23	HA8RA	569	59919		(DUP.)	0
	2158	OK1Y	579	56719			1
	37	DL8PA	599	52919			1
27	0236	OK1Y	559	58919			1
	59	OK1Y	569	52919		ITALY	1
	0312	WE8AX	569	56989	09	U.S.A.	3
	17	WA8NTG	569	56989			3
	29	WA8NTG	569	56905	05		3
TOTAL ZONES, COUNTRIES, POINTS THIS SHEET							5 8 28

CQ Form 1056 rev. May, 1962. (22 QSO's)

A sample log page—40 QSO's to a page. You may work your own country for multiplier credit, but receive NO QSO points. Logs must be checked for correct point credit and duplicate QSO's.

CQ will award championship plaques to stations ineligible for a trophy.

Trophy winners may win the same trophy only once within a three year period. (This does not apply to any of the CQ plaque awards)

The Canadian, Carib./C.A. and African awards are for native residents only.

X. CLUB COMPETITION: CQ will award a handsome plaque to the club submitting the highest aggregate score of the phone and c.w. scores submitted by its members.

1. The club must be a local group and not a national organization.

2. Participation is limited to members operating within a local geographic area, (except for DX-peditions especially organized for operation in the contest and manned by members.

3. To be listed, a minimum of 3 logs must be received from a club and an officer of the club must submit a list of participating members and their scores, both on phone and c.w.

4. Participating members must indicate the name of their club on their Summary Sheets.

XI. LOG INSTRUCTIONS: 1. All times must be in GMT.

2. Indicate zone and country multiplier only the FIRST TIME it is worked on each band.

3. Logs must be checked for duplicate contacts, correct QSO points and multipliers, and recopied logs must be in their original form with corrections clearly shown.

4. Use a separate sheet for each band.

(Please circulate this information to your DX friends and radio clubs)

CO World Wide DX Contest CO

Year 1968
Last Full Weekend of October (Phone) & November (CW)

Call Sign WIWY Country U.S.A.

Contest ☐ Phone ☒ Single Operator ☐ Single Band ☒ Multi-Operator ☐ All Band Entry ☒ Single Transmitter ☐ Multi-Transmitter

Band	QSO's	QSO Points	Zone Multiplier	Country Multiplier	Score
1.8 mc	3	3	X 2	+ 4	= 24
2.8 mc	18	9	X 12	+ 80	= 108
7.8 mc	44	22	X 28	+ 121	= 1008
14 mc	128	64	X 53	+ 361	= 4256
31 mc	61	30	X 33	+ 169	= 1008
50 mc	3	3	X 3	+ 9	= 27
All Bands	256	78	X 131	+ 714	= 149,226

How to score: QSO Points x Zones x Countries = FINAL SCORE
EXAMPLE: 1000 QSO Points x 130 Zones x 75 Countries = 1,050,000 points

Station Description _____
Antenna _____
Operator _____
Remarks: Biggest Multiplier in Contest: _____
Worked OH2AM on 5 Bands -
3.5 throw 2.8 mc!

Club Competition: _____
This is to certify that on this contest I have operated my transmitter within the regulations of my license and have observed fully the rules and regulations of the contest.
Name FRANK ANZALONE Call WIWY
Address 14 SHERWOOD ROAD
City STAMFORD State or Country CONN. USA Zip 06905

Logs must be postmarked no later than December 1st for PHONE and January 15th for CW. Indicate PHONE or CW on envelope. Mail to: CQ Contest Committee, 14 Vanderventer Ave., Port Washington, N.Y. U.S.A. 11050

A sample summary sheet. Free summary sheets, log pages and zone maps may be obtained upon receipt of a large s.a.s.e. or, if outside the U.S., sufficient IRC's. When you send in your score... include photos.

5. Each entry must be accompanied by a Summary Sheet showing all scoring information, category of competition, contestant's name and address in BLOCK LETTERS and a signed declaration that all contest rules and regulations for amateur radio in the country have been observed.

6. Official log and summary sheets and zone maps are available from CQ. A large self-addressed envelope with sufficient postage or IRCs must accompany your request.

If official forms are not available, make up your own by following the samples shown, 40 contacts to the page on 8½" x 11" paper.

XII. DISQUALIFICATION: Violation of amateur radio regulations in the country of the contestant, or the rules of the contest; unsportsmanlike conduct; taking credit for duplicate contacts in excess of 3% of the total made, incorrect QSOs or incorrect multipliers will be deemed sufficient cause for disqualification.

Actions and decisions of the CQ Contest Committee are official and final.

XIII. DEADLINE: All entries must be postmarked NO LATER than December 1, 1970 for the Phone section and January 15, 1971 for the C.W. section. In rare isolated areas the deadline will be made more flexible. Indicate phone or c.w. on envelope. Logs go to:

CQ WW Contest Committee
14 Vanderventer Avenue,
Port Washington, L.I., N.Y. USA 11050

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Evolution of the Decibel

BY JAMES M. BRUNING,* K2BZ

Evolving from a set of lecture notes, this two-part article describes the origin and use of the familiar, but oft-misunderstood decibel, without resorting to logarithms or other mathematics beyond simple arithmetic.

THE decibel is just about fifty years old. One would think that by now the mystery should have been stripped away from this really simple unit of measurement. However, we find that the decibel is still capable of striking terror into the hearts of many thousands of good technicians, and more than a few engineers.

The purpose of this article is to show *why* there is a decibel, *where* it came from, *what* it looks like after we take off its mathematical clothing, and *how* to use it with simple arithmetic. The word "logarithm" will not be used. This paper is *not* intended for the man who already knows all the answers. It is directed to the reader who really *doesn't* understand the decibel, but would like to know and use it.

The Standard Mile of Cable

Let's start way back before the days of radio broadcasting. The electrical transmission of speech was accomplished through the use of two wires connecting a "transmitting" and "receiving" station. In some cases, only one wire was used, and the return path was through the earth, which served as the second conductor. Generally, though, the stations were connected through a "pair" of wires. Different kinds of wire were tried, chiefly copper and iron. In fact, iron wire was still in wide use as late as the 1930's. Copper wire was far more expensive, but much better than iron because it had only one-sixth as much resistance for the same size conductor.

Wire size and spacing had pronounced effects upon the intensity and quality of the speech transmitted. If wire "thickness" was increased, the ohmic resistance went down. If wire "spacing" was increased, the shunt capacity (capacity *between* the wires) went down. In both cases, the effectiveness of the "line" was greatly improved. Unfortunately,

there was no way to measure the *amount* of improvement.

Further increase in the number of lines employed made it necessary to use cables in which a number of insulated wires were encased in a lead sheath. The situation existed wherein customer and inter-office trunk lines of widely different construction and effectiveness were in use. It was evident that a standard unit of comparison must be set up to measure the effectiveness of the various circuits.

Weighing the costs involved, and the general order of performance obtained, the best all-around line appeared to be 19 gauge copper-wire cable, having a d.c. resistance of 88 ohms for the two wires, and a distributed capacity of 0.054 microfarads, per linear mile. This type of line became known as "standard," and a measuring unit called a "mile of standard cable" was adopted. Before this could be used as a yardstick, it was necessary to design a test set or "box" that would contain several miles of this cable.

By connecting together a group of small fixed resistors and capacitors having electrical characteristics equal to those of "standard cable," and bringing out suitable taps, it became possible to construct the desired test set. Movement of panel switches could select resistance and capacity values equivalent to any desired number of "standard cable miles."

If a new circuit were to be tested, the observer's voice was sent alternately through the new circuit and the test set. Switches were manipulated until the output sound was heard to be identical, regardless of whether the actual line or test box was being used.

When this condition was obtained, the effectiveness of the line under test was rated as equivalent to the number of miles of cable set up within the test box. A circuit rated as having a transmission equivalent of "three

*14 Noel Drive, North Arlington, N.J. 07032.



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This valuable book is imported from Germany and written by DL1CU. It contains a collection of phrases and expressions designed to assist those amateurs who wish to enlarge their knowledge of various languages for use on amateur radio. It is a must for every DX'er. \$1.50

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Ken Grayson has loaded this book with schematics for currently popular pieces of conversion gear, making it invaluable to amateurs as a guide to surplus gear. \$2.50

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Edited by Art Seidman, a 160 page mass of antenna information directed at answering a multitude of questions surrounding the mysterious antenna. \$3.00

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miles" of standard cable had fewer losses and was clearly a higher grade channel than one rated as "ten miles."

It was now possible to measure losses in entire circuits, or portions of a circuit, or even specific pieces of equipment. If different components of the system had losses of say three, four, and three miles, it was convenient to add these losses and say "system loss is ten miles."

While this approach was a great advance in engineering practice, certain disadvantages soon became apparent. Results varied from day to day, and different observers could not agree as to the "number of miles" that were the exact equivalent of a particular line. It was found that these discrepancies were related to the average pitch of the speaker's voice, and the hearing ability of the listener to detect small variations in sound intensity.

In fact, the "attenuation loss" varied considerably with frequency, which was not strange, considering that each line contained series resistance, series inductance and shunt capacity. It was evident that only one test frequency could be used without causing serious errors. "Voice power" as a prime energy source was dead. The day of the audio test oscillator had arrived.

The Transmission Unit

A new standard called the "Transmission Unit" or "TU" was next adopted. This used the same mile of standard cable, with an added qualification that the frequency being measured must be 800 c.p.s. A meter was substituted for the listener's ear at the far end of the circuit. Precision results could now be obtained and duplicated at will. The same principle of "adding the losses" was retained. A successive loss of 3 plus 4 plus 3 equalled 10 TU's.

Meanwhile, back in the Forum, it had been learned that the essential range of frequencies needed to carry commercial intelligibility was roughly 300 to 3000 c.p.s. The test could not be considered as truly "representative." So a higher frequency of 890 c.p.s. was tried with good results, and finally the test frequency of 1000 c.p.s. was adopted as standard. (The number 1000 also helped considerably with the arithmetic!) Measurements were now made at 1000 c.p.s., but the unit was still defined as a "standard cable mile at 800 c.p.s." It was time for a further refinement of the standard.

The Decibel

Experimenters had noticed that a volume change of about 20% was just noticeable to an average listener. The addition of one mile of standard cable to a circuit under test caused such a loss. If the science of mathematics could relate these facts in such fashion that computations could readily be made, then the basis for a natural unit of measurement was at hand. Mathematics came through with flying colors. One of its branches, whose name we promised not to use, makes it possible to substitute simple addition and subtraction for multiplication and division. The desired unit would operate on this basis.

Such a unit was developed and adopted. It was called the "db." The full name is decibel. The first syllable means one-tenth, and the last syllable is taken from the name of the inventor of the telephone, Alexander G. Bell. The decibel is a small unit. The bel is a large unit. The bel is ten times as great as the db.

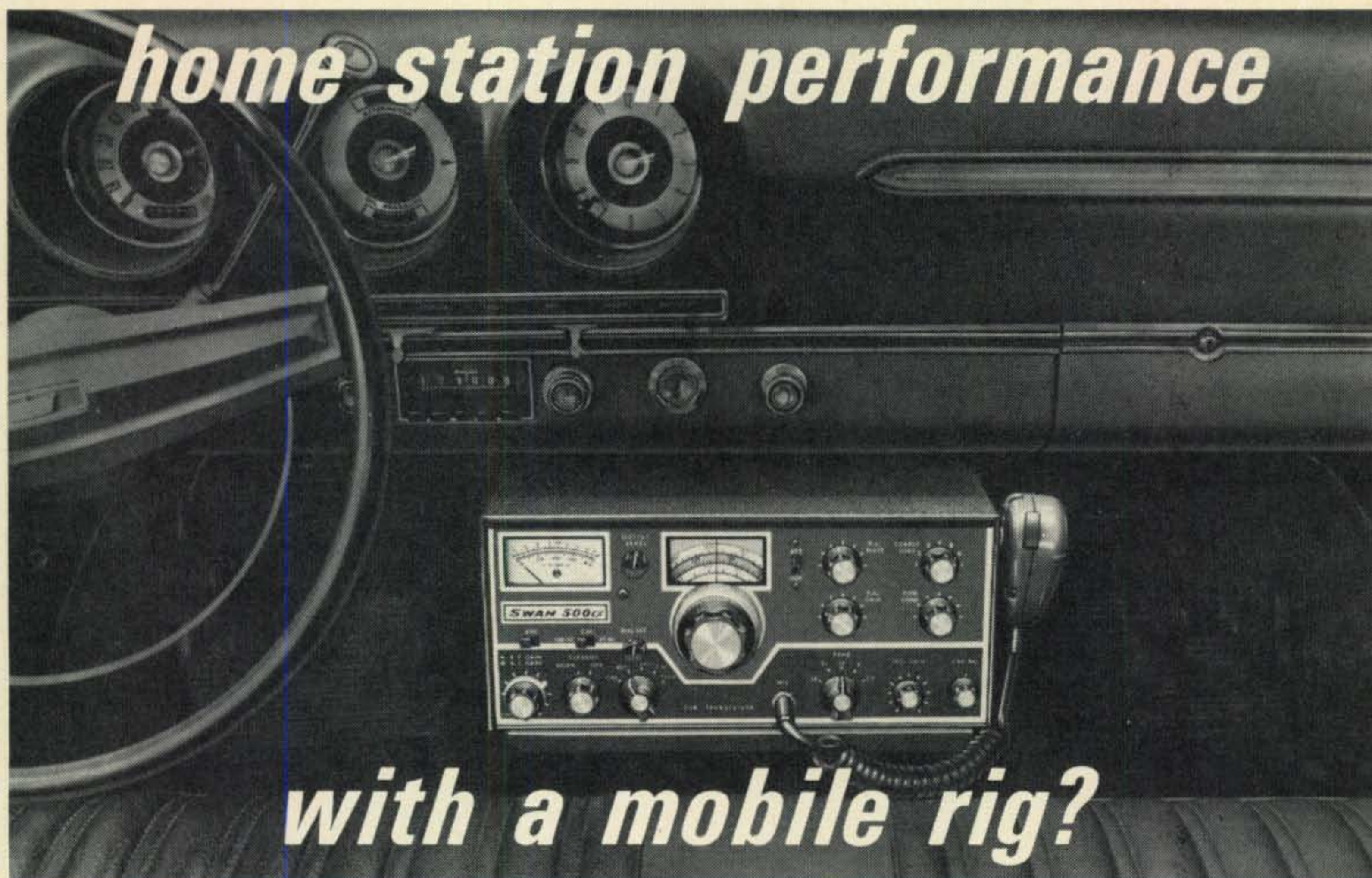
The db is simply a "yardstick." There are many different yardsticks. Automobile engineers use "horsepower," bankers use "dollars." In each case the unit measures something. A car owner is interested in the number of miles per gallon obtained from his car. He desires to get the most out of what is put in. He is interested in efficiency. Efficiency is merely the ratio of output to input. The decibel expresses the *ratio* between the output and input of an electrical or acoustical circuit. Therefore, the db is used to measure the *efficiency of a circuit*.

If 50% of the voice power put into a transmission line is received at a distant point, the efficiency of the circuit is 50%. If 80% of applied electric power passes through a transformer, then that transformer is 80% efficient.

We know that power changes of only two or three percent are not noticeable by the human ear, or for that matter by most meters. A worthwhile system for measuring speech power should be one in which *each* noticeable incremental change is evident to normal listeners.

Circuit Loss

The old "mile of standard cable" and the later "TU" both met this requirement. In both cases a ratio appeared between input and output. The loss through each standard



NOTHING COMES CLOSER THAN THE SWAN 500CX

The performance of the Swan 500CX in your car may not quite equal your home station, but you will be amazed at how often the difference is very small. Many Swan mobile operators have established enviable DX records. QSL cards on file here at the factory verify solid contacts from all continents, including stations in Antarctica.

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ACCESSORIES:

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unit was around 20%, so the change was perceptible to most listeners. Since about 80% of the energy "got through," the ratio of output to input was 80%.

A very slight change in the numerical value of this "natural" ratio allowed the "math" to be handled with ease. The new ratio expressed in percent was 79.4%, or if you prefer, 79.4326%. The beauty of this particular number is evident when we note that, for all practical purposes, 79.4% multiplied by itself three times (0.794 cubed) equals 50%. And 79.4% multiplied by itself TEN times equals 10%. One already starts to anticipate that a 3 unit loss (-3 db) will reduce the power to one-half of its former value, and a 10 unit loss (-10 db) will reduce the power to one-tenth of its former value.

Circuit Gain

Now that we have the idea of circuit losses fairly well fixed in mind, let us apply the decibel concept to components which produce a gain.

We learned that if a component produces a loss of 1 db, the output will be only 79.4% of its input. But suppose we feed a given amount of power into an amplifier which adds energy to the circuit. Also, suppose that after making some measurements we find that the input was only 79.4% of the output. In this case, and considering only the input and output signals, the amplifier is more than 100% efficient! If we end up with more power than we started with, there has been a gain. How much is the gain, when the input is 79.4% of the output?

Very simple. We assume the amount of output power to be "unity," represented by the number 1.0, and divided this number by the input value (which was 79.4% of the output). This means 1.0 divided by 0.794, and the answer is 1.2594, which tells us that the amplifier multiplies the input 1.26 times. The amplifier is 126% efficient as a circuit element, measuring it has produced a gain of 26%. You have probably already guessed that this "special case" is one in which a gain of 1 db has been produced. Correct!

We now have the situation where, if we hold to our fundamental idea of efficiency (how much of input becomes useful output), then a 1 db change in level correspond to either 79.4% or 126%. To differentiate between the two, we say 79.4% represents a 1 db loss (-1 db), and 126% represents a 1 db gain (+1 db).

Since the 126% figure was derived from the 79.4% figure, it should also possess some interesting properties. It does! 126% multiplied by itself three times (1.26 cubed) equals 2. And 126% (1.26) multiplied by itself ten times equals 10. So a 3 db power gain (+3 db) will double the power. And a 10 db power gain (+10 db) will multiply the power ten times.

From the above, we can see that decibel values are reciprocals of each other. 79.4% of 126% is 100%. And 126% of 79.4% is 100%. Also, a -3 db loss drops the power to one-half, while a +3 db gain multiplies the power by 2. And a -10 db loss drops the power to one-tenth, whereas a +10 db gain multiplies the power by ten.

Combining Gains and Losses

An outstanding advantage of the decibel system is made clear by the following example. Assume a circuit with four components having efficiencies of 79.4% (-1 db); 63.04% (-2 db); 126% (+1 db) and 79.4% (-1 db). The overall loss by "percentages" equals $0.794 \times 0.6304 \times 1.26 \times 0.794$. After much perspiration, this works out to be 0.500757836, which in English means 50%. How much simpler to solve the problem by just adding the db losses and gains of -1, -2, +1, -1, for a total of -3 db, which we already recognize as a 50% loss!

Note that db's, whether plus or minus, are added algebraically, whereas percentages are always multiplied. If one is used to the term "decibel," and has acquired a feel for the magnitude of a few of the decibel ratios, it becomes second nature to express power gains and losses as "plus or minus so many db."

To prove that you are already well on your way, consider the following problem. You have a new Hi-Fi speaker which requires 20 watts of power. You read a beautiful ad for an amplifier which guarantees an output of 30 watts ± 3 db. Should you buy it? Well, +3 db doubles the power, and -3 db cuts the power in half. So the amplifier is guaranteed to deliver an amount of power *some-where in the range* between 60 watts and 15 watts. Clearly, you would not buy it. If the amplifier produced only 16 watts of power, it would be doing exactly what the advertiser said it would do: 30 watts ± 3 db!

[To be continued]

DIGITAL CQ AND METEOR SCATTER DATA GENERATORS

BY G. E. GOODWIN,* G3MNQ

Part II

Part I of this two part series described the basic building blocks of the digital CQ and meteor scatter data generators. Part II below develops the circuits for four generators, two of each type, using the building blocks of the first installment.

THE circuits described in Part I can be used to make up almost any complete system. Four such systems will be evolved, 2 for CQ generators and 2 for meteor scatter (MS) data.

First a simple CQ generator which will send CQ plus band ident plus call sign; for example, CQ 2 de G3MNQ, with the optional addition of an automatic stop circuit. A more ambitious CQ generator follows which sends 3 CQs, has the choice of 9 band idents and follows with 3 callsigns; for example, CQ CQ CQ 2 de G3MNQ G3MNQ G3MNQ. It has the option that this can be sent three times or repeated as many times as required and has the facility that the call is completed then followed by a 'pse k' after the stop pushbutton has been pressed.

The first MS data generator produces both call signs, reports and continuous 'R's for acknowledgement while the more complex one sends two types of reports in a more complicated pattern. In both types reports are selected by the operator by means of switches while the other station's call sign can be built up by means of plugs and sockets.

Simple CQ Generator

In order to generate a call such as 'CQ 2 de G3MNQ' it is first broken down into three separate parts. These are:

- CQ
- 2 de
- G3MNQ

This determines that there will be three positive lines for the code selection diodes

and the programmer must select each of these in sequence. Also there will be three reset points in the code lines which will instruct the programmer when each code is complete.

The block diagram for the programmer is shown in fig. 14 and consists of two monostables (as fig. 8, one with 3 trigger inputs, the other with 2 and the output taken from TR₁), two bistables which together select any one of four different states and a 2 input OR gate as in fig. 3A. The four 2 input AND gates are the decoder for the bistables so that only one of the outputs is positive at any given time.

Switching to 'on' puts a positive pulse into MONO₁ which causes it to generate a pulse to reset BS_{1,2} and, via OR₁, to reset the counters. At the same time positive supply voltage is applied to the oscillator (fig. 7B) which will commence feeding pulses to the counter chain. Since BS_{1,2} have been reset AND₁ will have a positive output and the 'CQ' will be

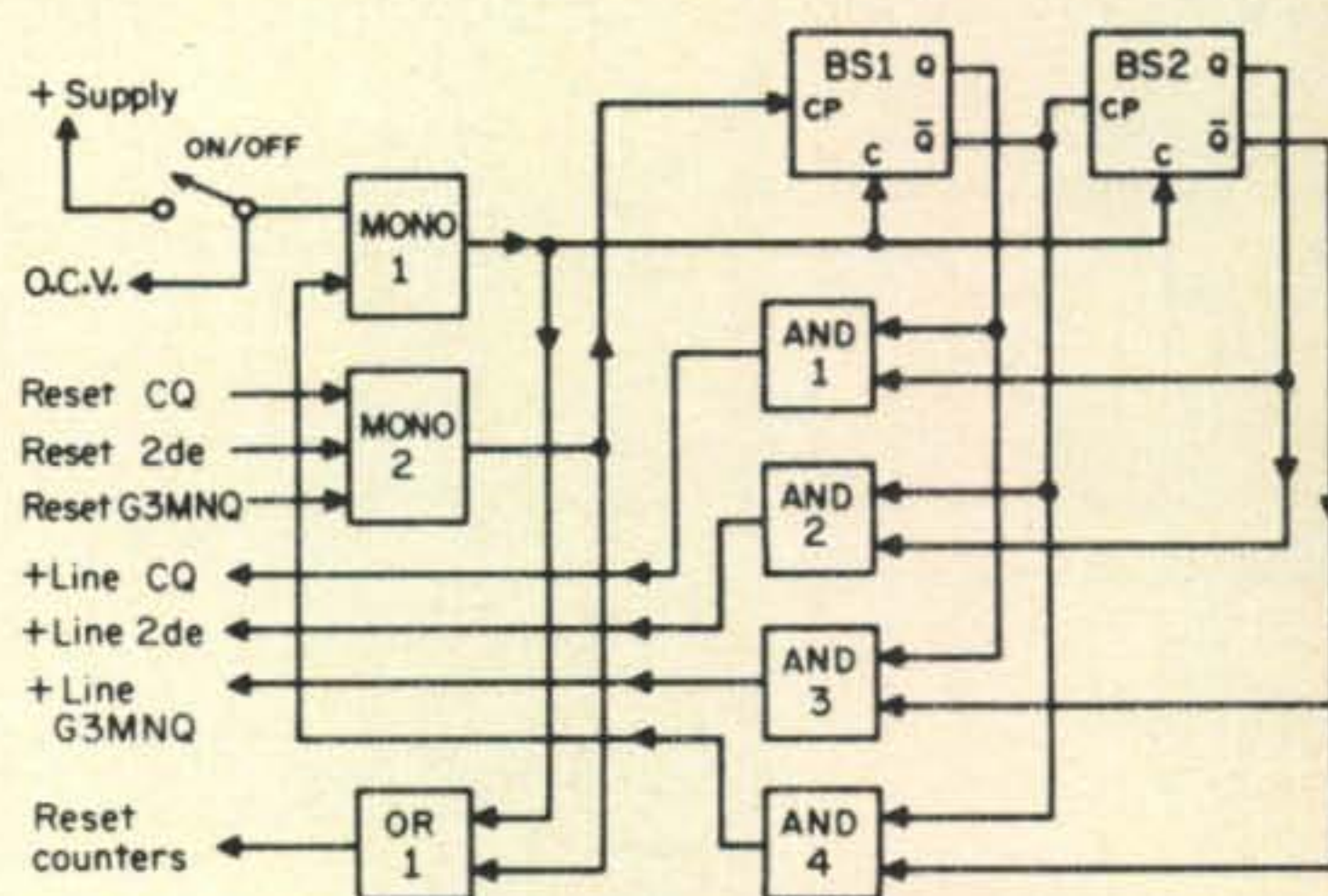


Fig. 14—Block diagram of the programmer for the simple CQ generator.

*Elfin Grove, Dunton Bassett, Rugby, Warks, England.

This cycle will repeat as many times as it is required, *ie.*, until the on/off switch is turned off. This, of course, could be made to occur anywhere throughout the cycle. This may not be very desirable but it is one of the limitations of a simple generator.

An automatic stop unit can be added by breaking the AND₄ gate output line to MONO₁ and inserting the circuit shown in fig. 15.

Operation will be the same until AND_4 goes positive. If the stop button has not been pressed AND_5 output now becomes positive and triggers $MONO_1$ which resets the counters and $BS_{1,2}$ to their initial state, and the cycle repeats.

[illegible]

The diagram illustrates a 4-bit counter circuit using discrete logic components. The circuit includes four flip-flops (BS1, BS2, BS3, BS4, BS5, BS6, BS7, BS8) and various logic gates (OR, AND, NOR, INV). It features inputs for Reset a, Reset c, Resets b, Counter reset, START, O.C.V., Reset d, +Line a, +Line b, +Line c, +Line d, and a STOP button. The circuit is powered by a 33K resistor and a 0.1 capacitor. The output of the counter is connected to a 7-segment display via a 2.2K resistor and a 33K resistor.

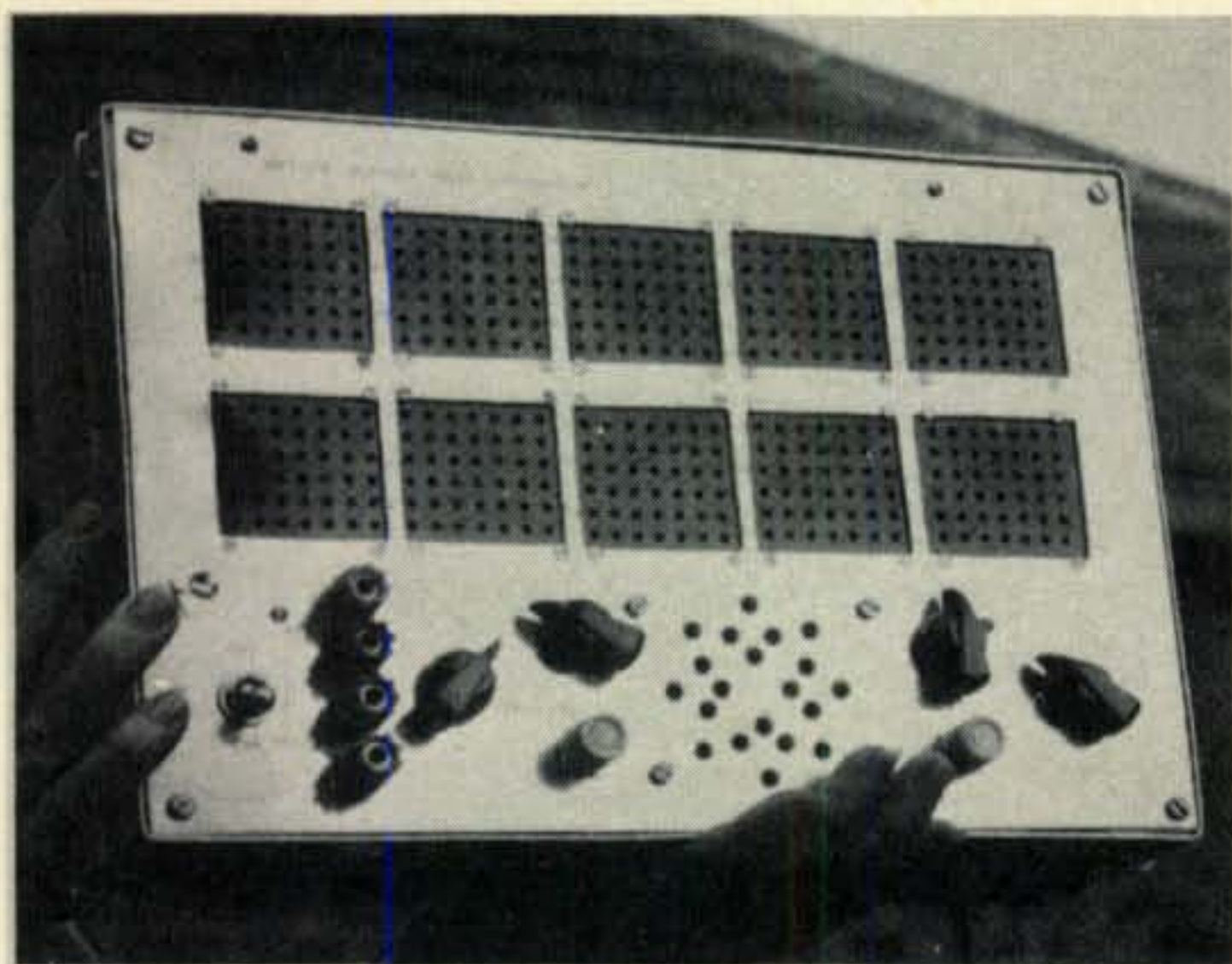
by the input to OR₁ from AND₆ and INV₁. The generator will therefore stop at the end of call sign.

Complex CQ Generator

- a) CQ (repeated 3 times)
- b) Band ident (manually selectable 160, 80.....4, 2, 70)
- c) Call sign (repeated 3 times)
- d) pse k (at end of call only)

OR₁ as fig. 3B.

42 • CQ • October, 1970



The revised Meteor Scatter data generator built by G3MNQ contains an inexpensive patch panel to permit the quick and completely flexible design of a c.w. M/S message.

NOR₃ as fig. 4A with 5 inputs, one being 33K ohm taken to positive supply
 MONO_{1,2,3}, as fig. 8 with output from Q₂
 INV_{1,2,3,4}, as fig. 1
 AND₁₋₈ as fig. 2B

Operation of the programmer is as follows with reference to fig. 16.

Pressing start pushbutton causes MONO₃ to produce a reset pulse which resets all the bistables and, via NOR₃, the counters. BS₆, when reset, makes the OCV line positive so that the oscillator will produce pulses; also BS_{3,4} are reset so that AND₁ output is positive and CQ is generated.

At the end of CQ a reset is produced at reset (a) which, via OR₁ triggers MONO₁. This moves BS_{1,2} by one count via NOR₁ and resets the counters via NOR₃. AND₁ is still positive since BS_{3,4} have not received a pulse and CQ is again generated. Reset again occurs moving BS_{1,2} and CQ is produced for the third time. When BS_{1,2} move on to their fourth state AND₇ output goes positive. This is routed via NOR₂ and triggers BS_{3,4} and AND₂ is made positive. Depending on the position of S_{1B}, one of line b will be made positive and the band ident will be generated. The reset from this line is selected by S_{1A} and triggers MONO₂ which resets the counters via NOR₃ and triggers BS_{3,4} via NOR₂.

Now AND₃ output goes positive and the call sign is selected. The reset from this triggers MONO₁ via OR₁ and the call sign is generated 3 times in exactly the same way as CQ. On receipt of the third reset pulse AND₇ goes positive which, via NOR₂ triggers BS_{3,4}.

AND₄ output now goes positive and, assuming the stop push button has not been pressed, AND₅ output also becomes positive due to the reset state of BS₅. This triggers MONO₃ which resets all bistables and the cycle repeats.

The stop pushbutton can be pressed at any time and, when it is, BS₅ changes state and Q output goes positive making one input to AND₆ positive. Operation is the same until AND₄ output goes positive and energizes line d. 'Pse k' is now generated and line d reset is inverted by INV₁ and changes the state of BS₆. This removes the positive from OCV and, via OR₃, resets the counters.

The circuit consisting of BS_{7,8}, INV_{2,4,3} and AND₈ is an optional extra and may be omitted. Its purpose is to limit the number of complete calls to three and then stop. If switched in it can still be overridden by the stop pushbutton.

BS_{7,8} are set to their initial state by the start pushbutton via INV₄. Every time AND₂ goes positive during normal operation BS_{7,8} is moved on by one count until, on receipt of the third trigger, AND₈ goes positive. This via INV₃ operates the stop circuit in exactly the same way as pressing the stop pushbutton. The generator then completes the call, sends 'pse k' and stops.

The code selection diodes will have 12 positive lines, 1 CQ, 9 band idents, 1 call sign, 1 pse k. There will be 12 reset points but only CQ, call sign and pse k will have AND gates since the reset points from the ident lines are selected by S_{1A}.

The controls on the front panel could consist of the following:

- 1) sending speed—6-24w.p.m.
- 2) START pushbutton
- 3) STOP pushbutton
- 4) NUMBER OF CALLS — 3 or unlimited
- 5) BAND IDENT
- 6) MONITOR ON/OFF and VOLUME
- 7) LINE ON/OFF.

Also of use are two indicator lamps to show STAND-BY and OPERATING, so that the operator knows the state of the generator if it is not being monitored.

The monitor referred to above is an audio tone produced when the keying contact closes; the circuit for this will be described later.

Meteor Scatter Data Generators

In the MS generators the programmer is semi-automatic as some information has to

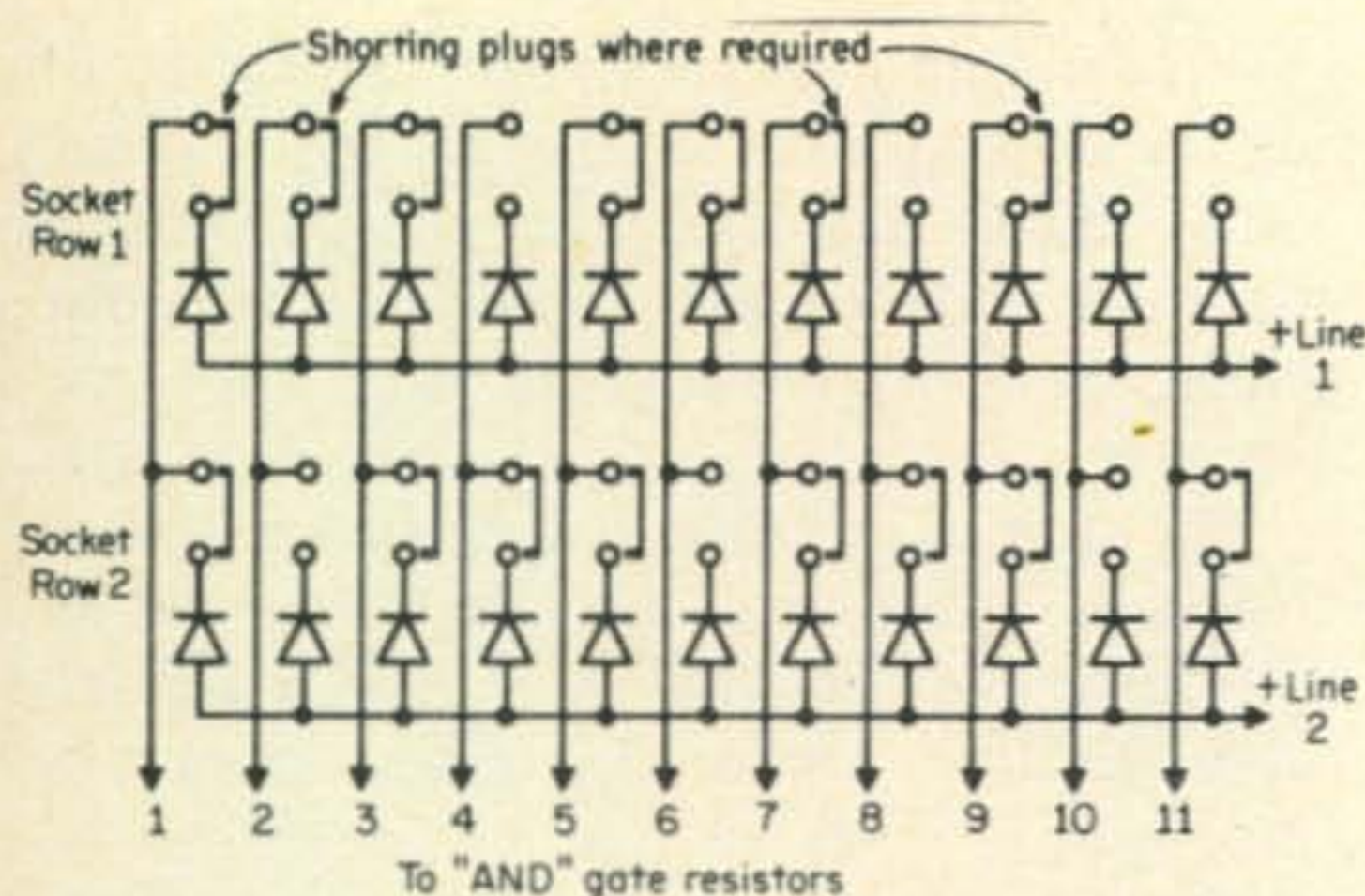


Fig. 17—A section of the front panel plugs and sockets used on the meteor scatter data generators.

be selected by the operator according to the state of the QSO. Also the other call signs will have to be changed for different stations being worked and some simple means must be provided to do this. Plugs and sockets mounted on the front panel were found to be the cheapest way of doing this but the method may vary according to the resources of the constructor. Plugs bridging two rows of sockets were used and since 100 of these are used they are arranged in four rows of 25. Reset sockets were also provided so that the reset point can be selected immediately following the call sign. To economize in space only even numbers above 50 were made selectable.

A section of the wiring of these sockets is shown in fig. 17 and this is actually part of the complex MS generator which has two arrays of plugs and sockets so that two call signs can be set up.

Simple MS Generator

The data to be sent is as follows:

- other call sign
- own call sign
- 'R' plus report (two numbers)
- 'RS' plus report
- continuous R

Each of these is allotted one positive line and these are selected by the programmer as follows:

- 1) a plus b
- 2) a plus b plus c
- 3) a plus b plus d
- 4) e

Several reports are included in the code selection diodes and the required one is selected by a switch. As transmissions are usually made at fixed time intervals (say every 5 minutes) auto-stop is not included.

The block diagram of the programmer (fig. 18) shows S_1 selecting the four modes listed above and S_2 selecting which report is sent. Three positions are shown but more can be added if necessary. S_3 selects either the plugs and sockets on the front panel or CQ. Using this and S_1 in position 1, CQ plus your own call sign can be sent continuously.

In fig. 18 OR₁ can be as fig. 3B with 6 transistors into a common load, MONO_{1,2} as fig. 8 with output from Q_1 and AND₁₋₄ as fig. 2 B.

Operation

With S_1 in position 1 switching on will trigger MONO₁. The output, via S_{1A} , resets BS_{1,2} to their initial state. AND₁ output is therefore positive and this is taken, via S_{1E} and S_{3B} , to line a1 or a2. CQ or other call sign is then generated. The reset is selected by S_{3A} and, via OR₁, triggers MONO₂. This resets the counters and, via S_{1B} , moves BS_{1,2} on by one count. AND₂ output is then positive and energizes line b, with your own call sign being generated.

The reset from this via OR₁ triggers MONO₂ which resets the counters and moves BS_{1,2} via S_{1B} . AND₃ output now becomes positive. This is routed via S_{1C} to MONO₁ which resets BS_{1,2} and the circuit continues on this cycle.

With S_1 in position 2 operation is the same until AND₃ goes positive and now this is routed via S_{1D} and S_{2A} to line c and the

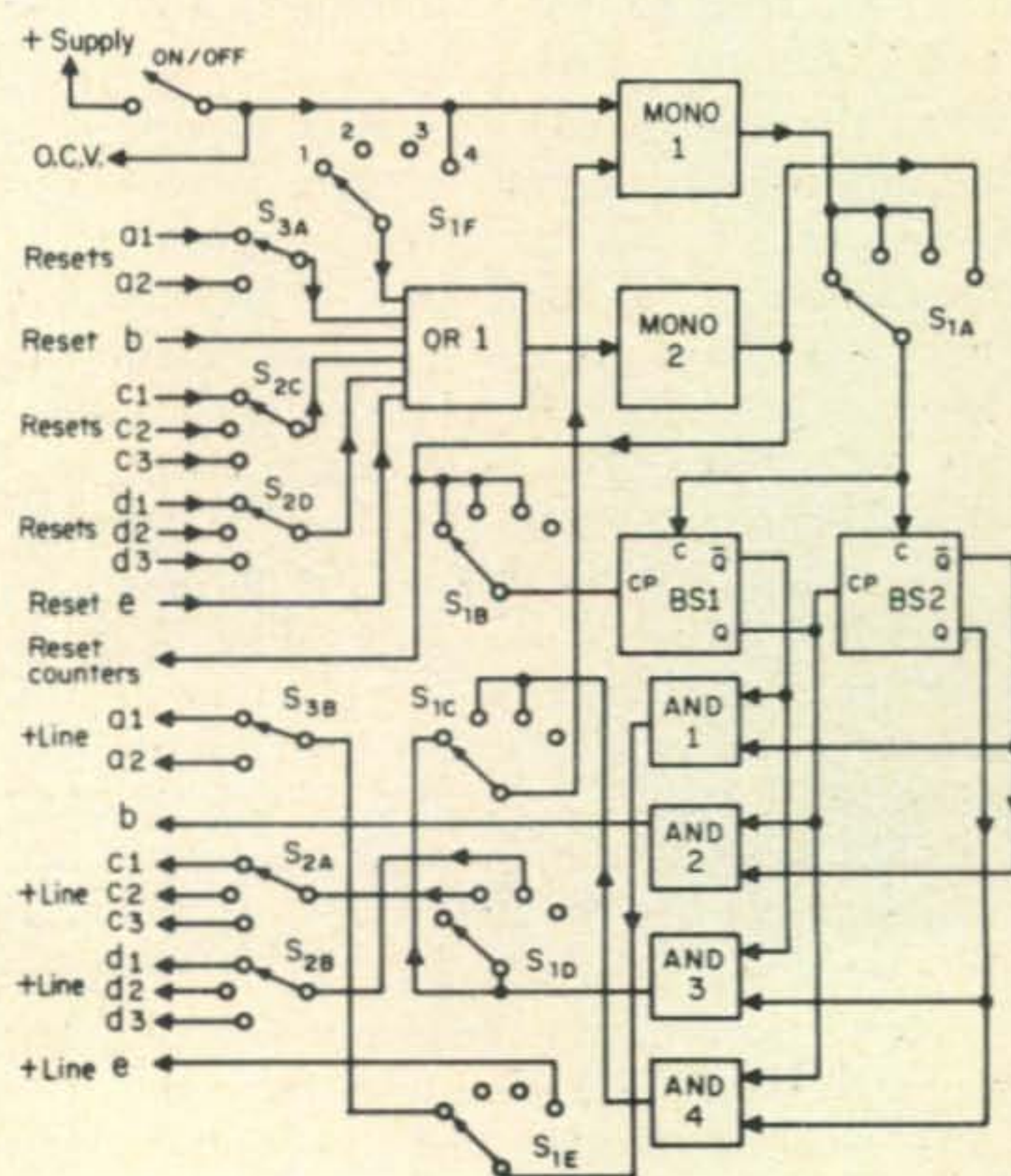


Fig. 18—Block diagram of the programmer for the simple meteor scatter data generator.

report is added to the call signs. The reset from the report line triggers MONO₂ via OR₁ which resets the counters and moves BS_{1,2} to their fourth position and AND₄ output goes positive. This, via S_{1C}, triggers mono₁ and resets BS_{1,2} and recycling takes place.

In position 3 of S₁, operation is the same except that line d is selected by S_{1D} and S_{2D} selects the reset.

Position 4 generates continuous R when the on switch is closed by triggering MONO₂ via S_{1F} which resets BS_{1,2} to their initial state via S_{1A}. AND₁ produces a positive voltage which via S_{1E} puts positive on line e. The reset from e re-triggers MONO₂ and the circuit repeats this *ad infinitum*.

Front panel controls for this will be the ON/OFF switch, CODE SPEED, S₁, S₂, S₃ and LINE. The predominant feature of the front panel will be the coding plugs and sockets.

Audio monitoring can be added with the relay drive circuits and hand keying can also be used with this generator.

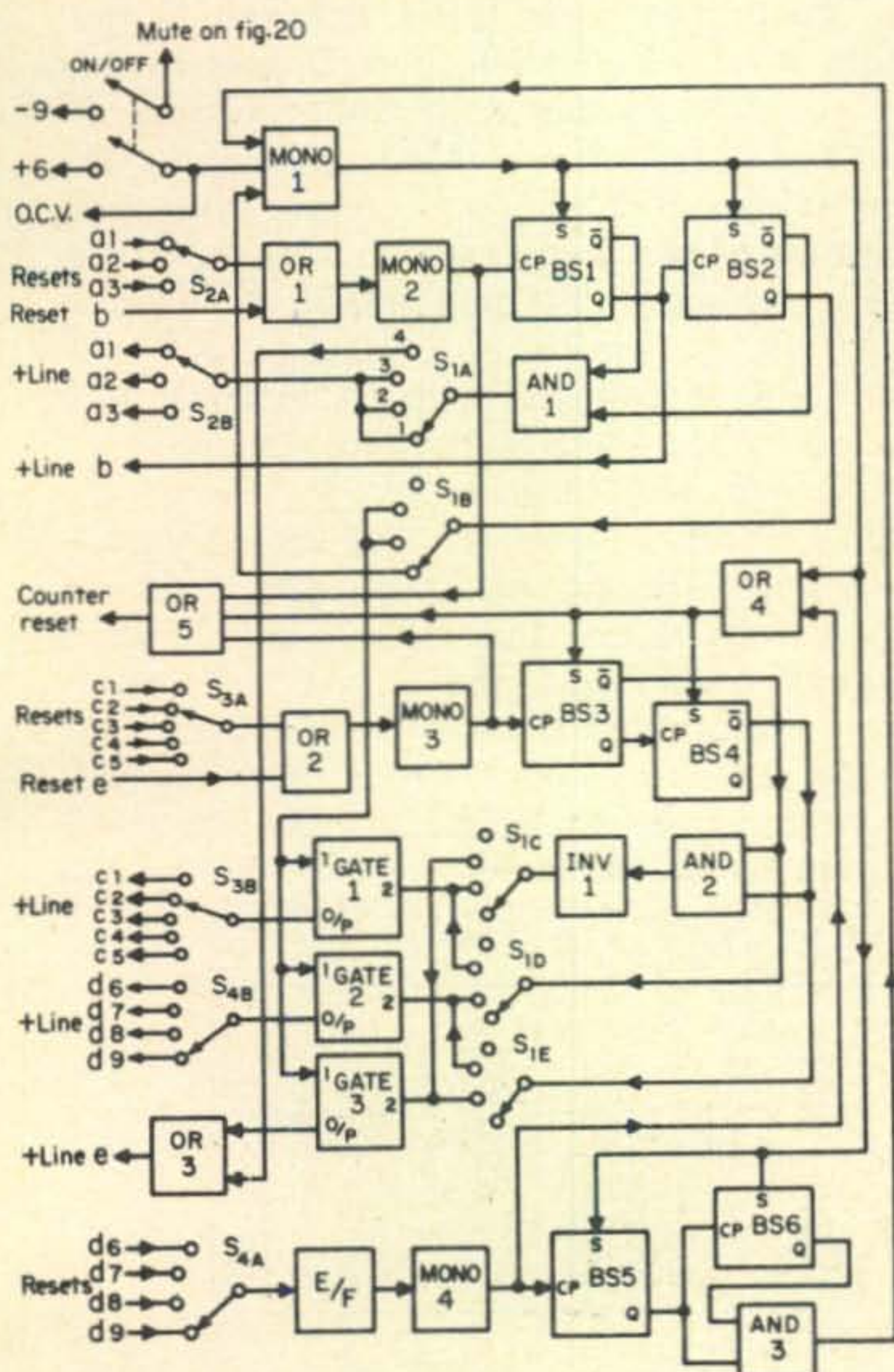


Fig. 19—Block diagram of the revised meteor scatter data generator programmer. Switch S₁ selects the required data, S₂ selects CQ, Socket row 1 or Socket row 2 and S₃ and S₄ select the required reports.

Revised MS Generator

Recently there has been some revision in the data required to be sent and this complicates the programmer considerably. The basic circuits and construction for this will be the same as those detailed above but the program will be as follows:

- other call sign
- own call sign
- signal duration report (nos. 1-5)
- signal strength report (nos. 6-9)
- continuous R

These are combined into the following sequences:

- 1) a plus b
- 2) a plus b plus 3 (c plus d)
- 3) a plus b plus 3 (e plus c plus d)
- 4) e

For example, in 2 and 3, call signs are sent once followed by reports repeated three times. With reference to the block diagram of the revised generator, fig. 19, the circuit details are as below:

MONO₁₋₄ as fig. 8 with outputs from Q₁.

OR₁₋₅ as fig. 3B.

GATES₁₋₃ as fig. 5.

AND₁₋₃ as in fig. 2B.

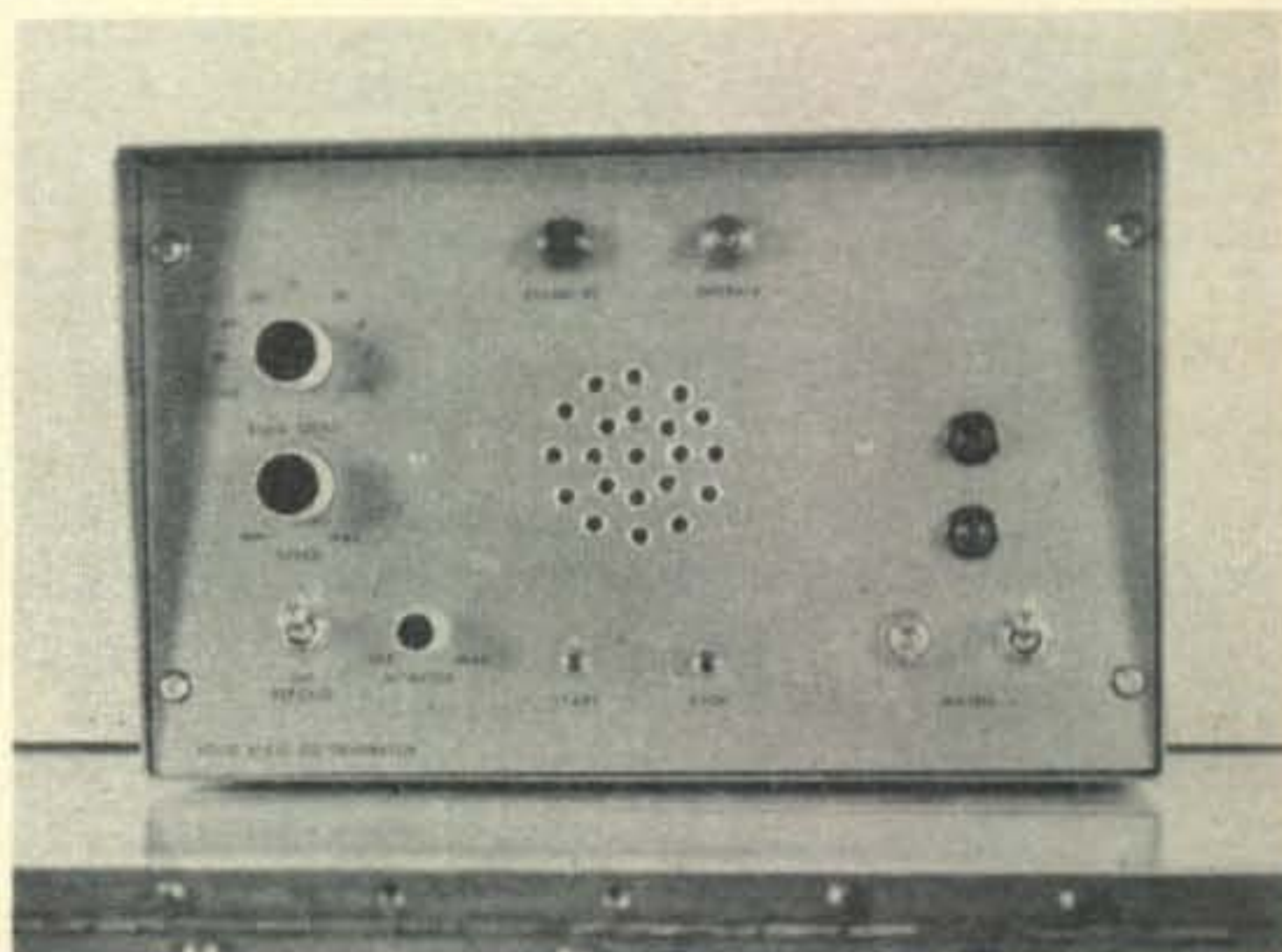
INV₁ as fig. 1.

E/F is a simple emitter follower.

There will be 14 positive lines, 2 being taken to the front panel sockets, 1 for CQ, 1 for call sign, 9 for reports and 1 for R. All reset points are selected by switches so no reset AND gates are required in this version.

Operation

With S₁ in position 1 closing the ON/OFF switch triggers MONO₁ and sets BS_{1,2} and



The complex CQ generator bears controls for selecting both the sending speed and band identification. Monitor lights and tone output are also included.

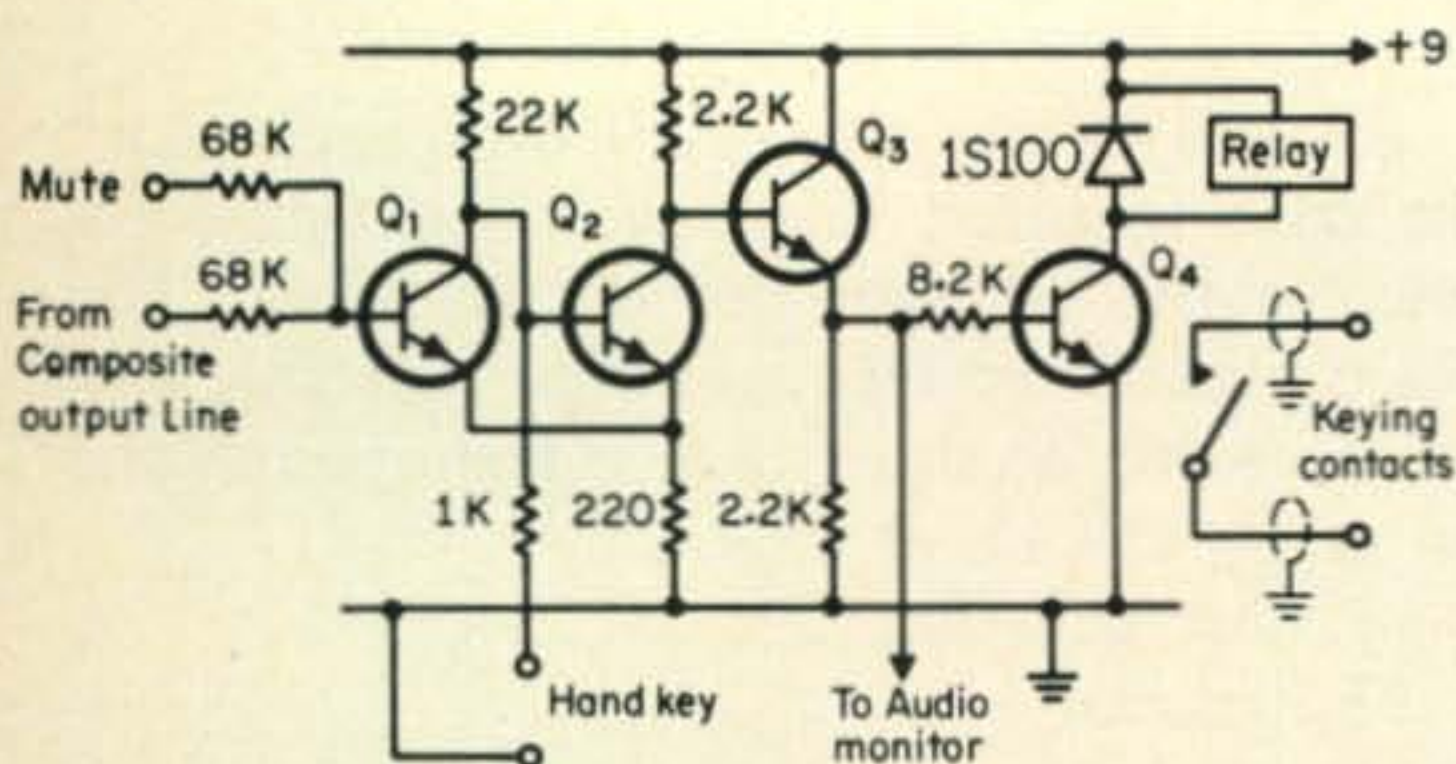


Fig. 20—Circuit of the relay drive system. Transistors Q_1 , Q_2 and Q_3 are 2N706 or 2N2926 types. The relay should be of the dry reed type with a normally open contact.

$BS_{5,6}$ directly and via OR_4 resets $BS_{3,4}$ and via OR_5 resets the counters. AND_1 is now positive which makes line a positive via S_{1A} and S_{2B} . The reset from line a is selected by S_{2A} and via OR_1 triggers $MONO_2$ which moves $BS_{1,2}$ on by one step and resets the counters via OR_5 .

Line b now becomes positive directly from the output of BS_1 , the reset having the same action as the reset from a. $BS_{1,2}$ now move on one step. Q on BS_2 becomes positive and $MONO_1$ is triggered via S_{1B} . This resets $BS_{1,2}$ and the cycle is repeated sending CQ or other call sign plus your own call sign, continuously.

With S_1 in position 2, operation is the same up to Q output of BS_2 going positive and this now is routed via S_{1B} and provides positive input to Vin_1 of $GATES_{1-3}$. $BS_{3,4}$ are in their reset state so AND_2 gives a positive output which is inverted by INV_1 . $GATE_1$ via S_{1C} inverts this again and line c is made positive. Numbers 1-5 are selectable via S_{3B} and S_{3A} selects the returning reset pulse which triggers $MONO_3$ via OR_2 . The output pulse resets the counters via OR_5 and moves $BS_{3,4}$ on by one step. $\bar{Q}$ output of BS_3 now becomes 0 which is routed via S_{1D} and the output of $GATE_2$ becomes positive, numbers 6-9 being selectable by S_{4B} and the reset by S_{4A} .

Mono 4 now produces a pulse as it is triggered via the E/F and this resets $BS_{3,4}$ via OR_4 and the counters via OR_5 , also $BS_{5,6}$ are moved by one step. Line c is now selected and this part of the cycle repeats until the reports have been sent three times. On receipt of the third reset pulse from reset d the output of AND_3 goes positive and triggers $MONO_1$ and this restarts the complete cycle in the same way as closing the ON/OFF switch did.

Position 3 of S_1 gives the same operation as above until the output of INV_1 goes to zero and this is now routed via $GATE_3$ and OR_3

whose output goes positive energizing line e. This produces RR and at the reset $MONO_3$ is triggered moving $BS_{3,4}$ on by one step and, via S_{1D} , $GATE_1$ output is made positive and numbers 1-5 are sent depending on the setting of S_{3B} . The reset of line c again triggers $MONO_3$ which, via S_{1E} , $GATE_2$ and S_{4B} selects line d. Recycling of RR plus 1-5 plus 6-9 continues using $BS_{5,6}$ again until the third reset from d makes AND_3 positive resetting all the bistables via $MONO_1$ and the complete cycle repeats.

The fourth position generates continuous RR and line e is used for this. As before, closing the ON/OFF switch resets $BS_{1,2}$ and the resultant positive output from AND_1 is taken via S_{1A} to OR_3 and to line e. The reset triggers $MONO_3$ which via OR_5 resets the counters and RR is again generated since $BS_{1,2}$ have not been moved from the reset position.

Relay Drive and Audio Monitor

The output from the Composite Output Line of the Code Selection Diodes in any of the circuits described above is some 2 volts in amplitude and is incapable of driving any relays directly. It is therefore taken to a Schmitt trigger circuit which squares off the pulse to some 9 volts amplitude without inverting the waveform. Q_1 and Q_2 in fig. 20 form this circuit and with Q_3 as an emitter follower, has a low output impedance.

Further amplification by Q_4 allows the signal to drive the relay. This should preferably be of the dry reed type with normally open contacts and the wires to the contacts should be shielded to prevent r.f. from entering the unit. It is shunted by a silicon diode to prevent back e.m.f. from the relay coil from destroying the transistor, Q_4 . The codes generated by the code selection diodes will

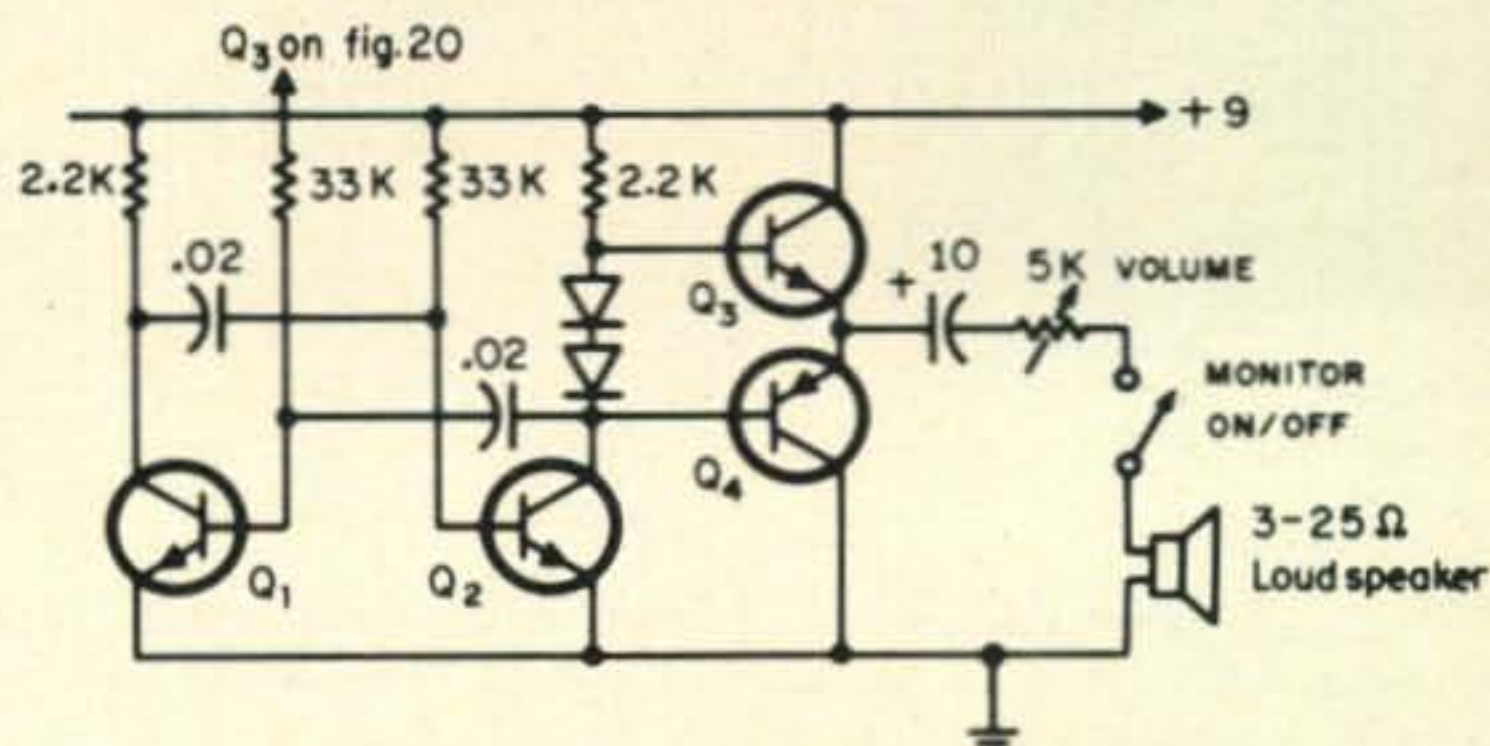


Fig. 21—Circuit of the audio monitor. Transistors Q_1 , Q_2 and Q_3 are 2N3702; Q_4 is a 2N3704. The volume control can be ganged to the monitor on-off switch and the loudspeaker can be any impedance between 3 and 25 ohms.

now cause the relay contacts to close and key the transmitter. The relay contacts should be wired in place of the normal hand key and must be capable of handling the voltage and current of the keying point.

The hand key facility in fig. 20 can be used at any time and provides a keying point which has one volt on its live side.

The audio monitor provides a tone so that the operator knows what is being sent, but it can be switched out if not required. It also monitors the hand keying.

The circuit (fig. 21) consists of a multi-vibrator, Q_1 and Q_2 , which generates a square wave of about 1 kc. This is controlled by the relay drive circuit as it will operate only when the top end of the 33K resistor is positive and this coincides with the closure of the relay contacts.

Q_3 and Q_4 form a low impedance driver stage for the loudspeaker the output of which can be adjusted by the volume control which is ganged to the switch so that the tone can be removed completely.

Indicator Lamps

These are optional but are useful to determine the state of the generator if the monitor is not being used.

The monitoring point is the OCV line which is positive during all operating and falls to zero when the code is not being produced. In fig. 22 $Q_{1,2}$ are inverters and when the OCV line is positive Q_1 is fully conducting and its collector voltage is zero. Q_2 is, therefore unbiased and its collector positive. This biases Q_3 on and the lamp is lit. Q_3 must be capable of carrying the lamp current and the power supply capable of supplying it. It need not be stabilized and a separate supply can be used if required.

Q_4 monitors the same point which when positive biases Q_4 on and therefore Q_5 is off

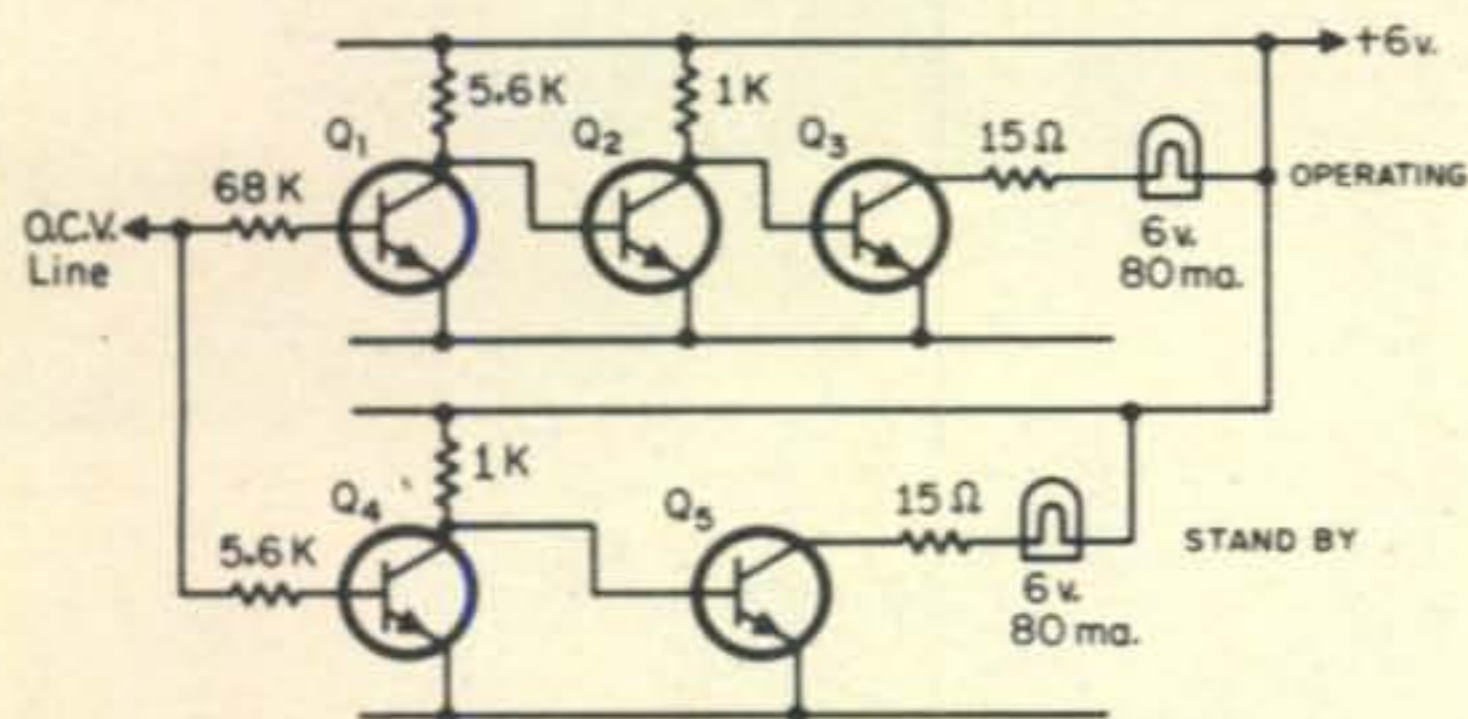


Fig. 22—Circuit for the indicator lamp. Transistors Q_1 , Q_2 and Q_4 are 2N706 or 2N2926; Q_3 and Q_5 are 2N3702. Lamps used in the prototypes were 6 volts at 80 ma.

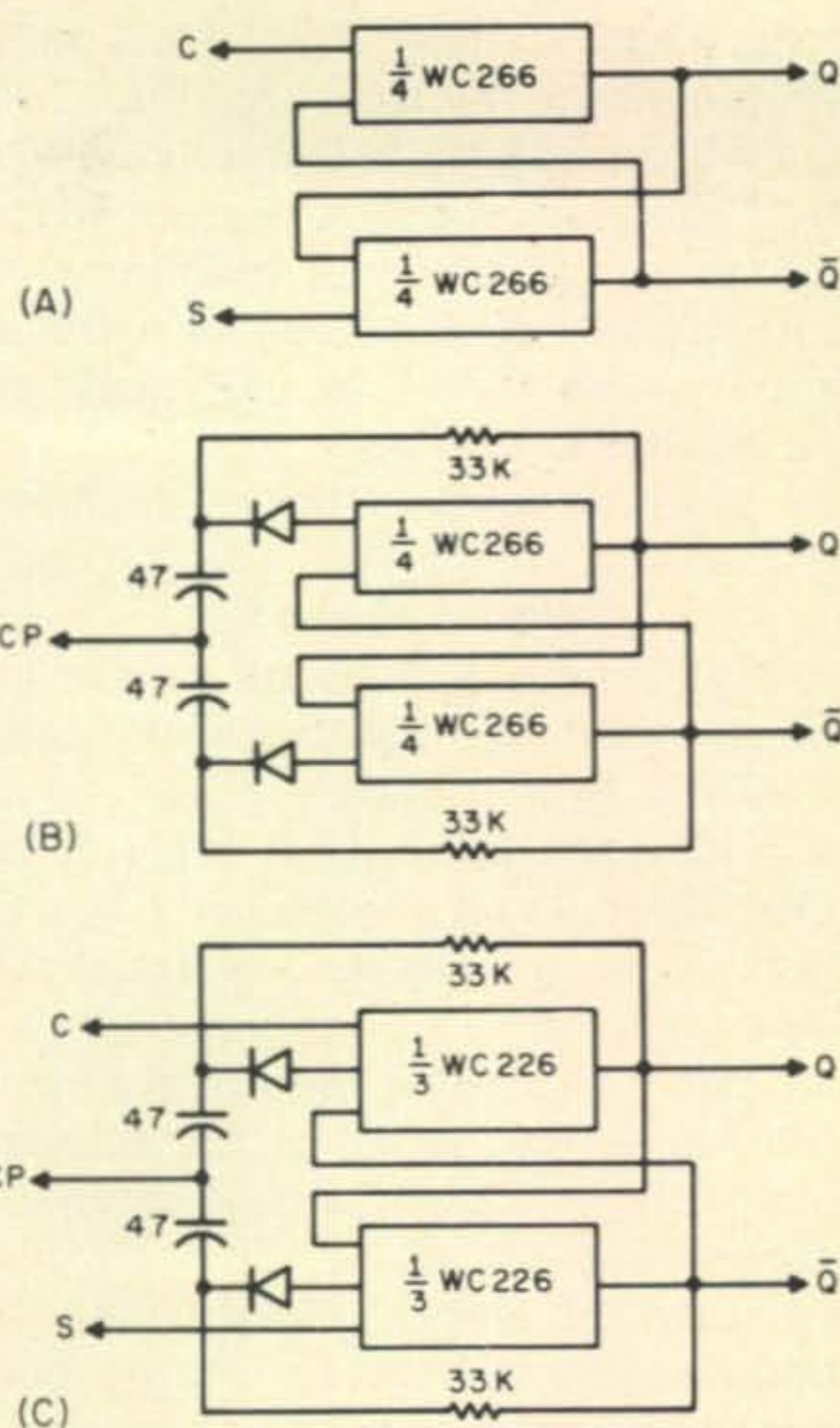


Fig. 23(A) — Connections required to make a bistable circuit from two 2 input NAND gates. This type has S and C facilities only. (B) A bistable with CP facilities only, using two 2 input NAND gates. (C) CP, S and C facilities are available when two 3 input NAND gates are used. Here, S or C will override CP inputs.

and the lamp is not lit.

When the OCV line falls to zero the opposite conditions apply and Q_3 is off and Q_5 on and the standby lamp is lit.

Some may prefer to monitor the positive lines to the code selection diodes so that the build up of a call can be observed particularly during initial testing. A circuit consisting of $Q_{1,2,3}$ connected to each positive line will enable the operation to be seen. This does not mean that all 14 lines of the MS data generator need be monitored as the arms of the switches can be tapped so only 5 lamps are required.

Bistables

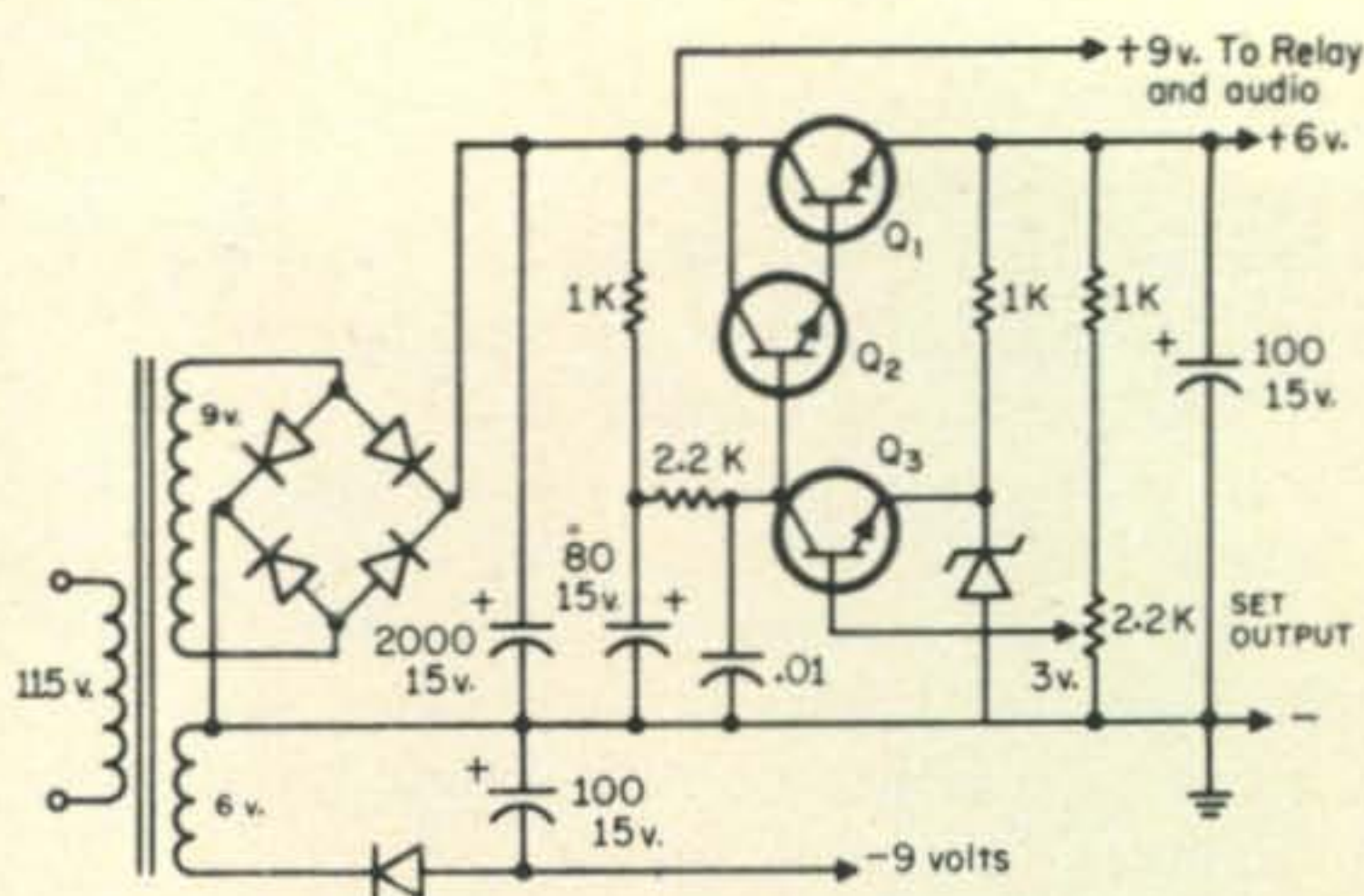
No mention has yet been made of the bistables used in these generators. In all units built these have been Westinghouse WC225 or equivalents but similar units using the same logic can be used.

A more economical approach can be used where all the facilities of the WC225 are not required. This occurs in the 1st and 3rd stages of the divide by 10 counters and in

Combinations of these can be used such as fig. 23C with the lower half made from 1/4 of WC266 so that reset plus clock facilities are available without the set facility.

These will naturally depend on the components and ICs used but to suit the circuits described fig. 24 is suitable.

Transistors $Q_{2,3}$ form the voltage regulator with the 3 volt zener as the reference. Q_3 as the voltage comparator, Q_2 as an emitter follower and Q_1 as the series regulator. When testing, the output should be left open circuited and the voltage set by the potentiometer. A 50 ohm resistor should then be placed across the output and the voltage should not fall by more than 0.1 volts. Only when it has been proved that correct operation is taking place should it be connected



to the ICs. The load is approximately 80 ma for simple units and about 130 ma for more complex ones.

Construction

In a project of this size the method of construction will depend largely on materials which are easily and cheaply available and much will have to be left to the individual.

Unusual High School at Unusual Location

The Cabrillo Zero Beaters as they are called has some 30 members, many of whom are licensed and operate the club station, W6GK. The president of the club is George Rock, WA6ENF, who holds an Advance class license. The club is in the midst of organizing a general list of active high school club stations and the bands they operate. High school clubs that are interested in such a list are requested to list their band capabil-

ity and time of usual operation on the back of their QSL and mail to: W6GK, Cabrillo HS, 4350 Constellation Road, Lompoc, California 93436. When the list is compiled into a directory, a copy will be forwarded to each club who responded.



Some members of the Cabrillo Zero Beaters

The Resistor-Rite

BY RUSS ALEXANDER,* W6IEL

A decade resistance substitution box makes a pleasant one-evening project which will make the life of the home-brewer just a little easier.

ONE important factor in the successful operation of home-brew gear is determining the proper values of circuit resistors, often a cut-and-try procedure. This article describes a simple, but effective device which helps the builder select optimum resistance values for circuits. Most of the parts are probably in the junk-box collection of the average home-brew artist.

The Resistor-Rite consists of potentiometers arranged and connected to permit selection of almost any resistance values for the circuit under test, and includes a switch to allow measurement of the selected resistance value on a v.o.m. The project described uses 5 linear taper pots; 100 ohms, 1k, 10k, 100k, and 1meg, giving a range of from near zero to 1,111,111 ohms. Figure 1 shows the circuit.

In LO-OHM range the residual resistance of the high value pots is shunted out and the 100 ohm pot alone is in the circuit.

Construction

Construction is quite simple. I used a $2\frac{1}{8} \times 1\frac{1}{2} \times 8\frac{1}{2}$ " Minibox and mounted the 5 pots as shown in the photo. Banana jacks for the circuit and v.o.m. connections were mounted on the ends of the box as shown, as were the FUNCTION and RANGE switches.

*4230 E. 10th St., Long Beach, Cal. 90804

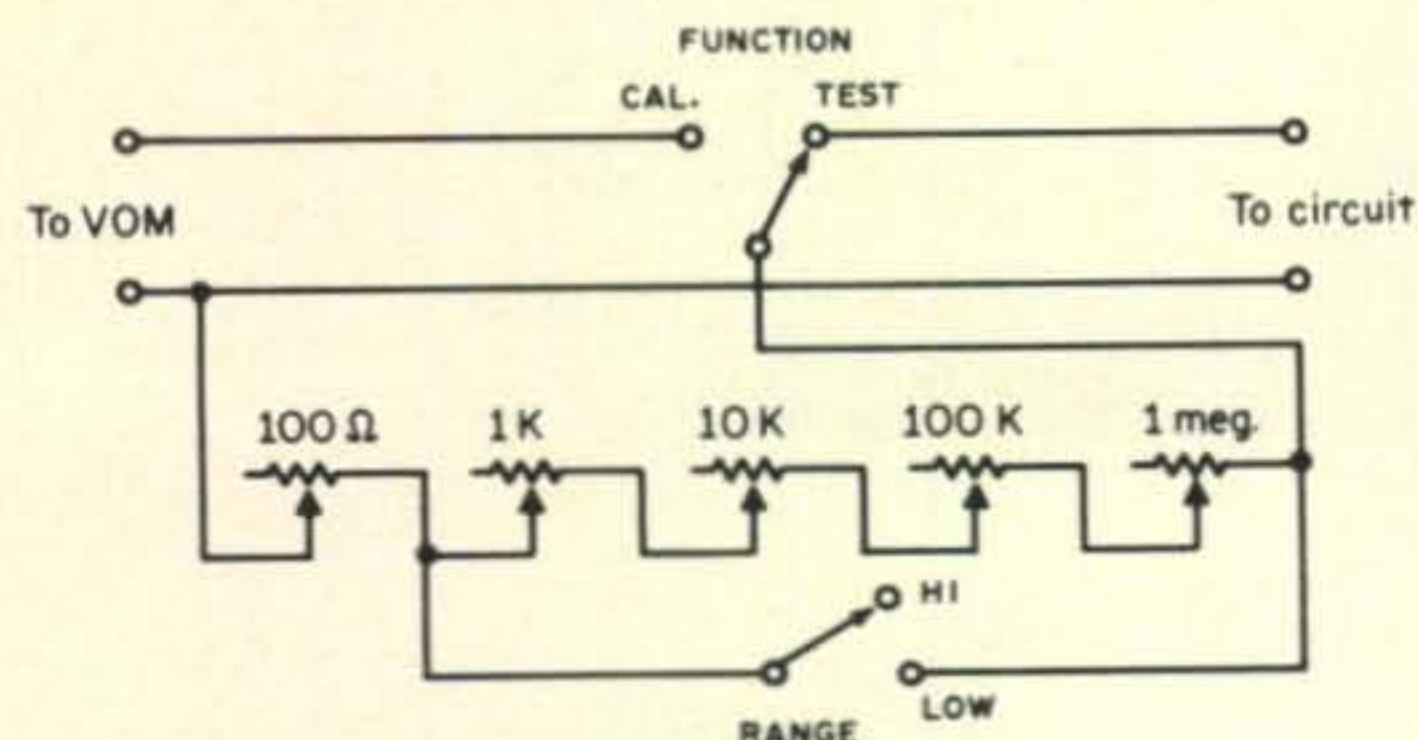


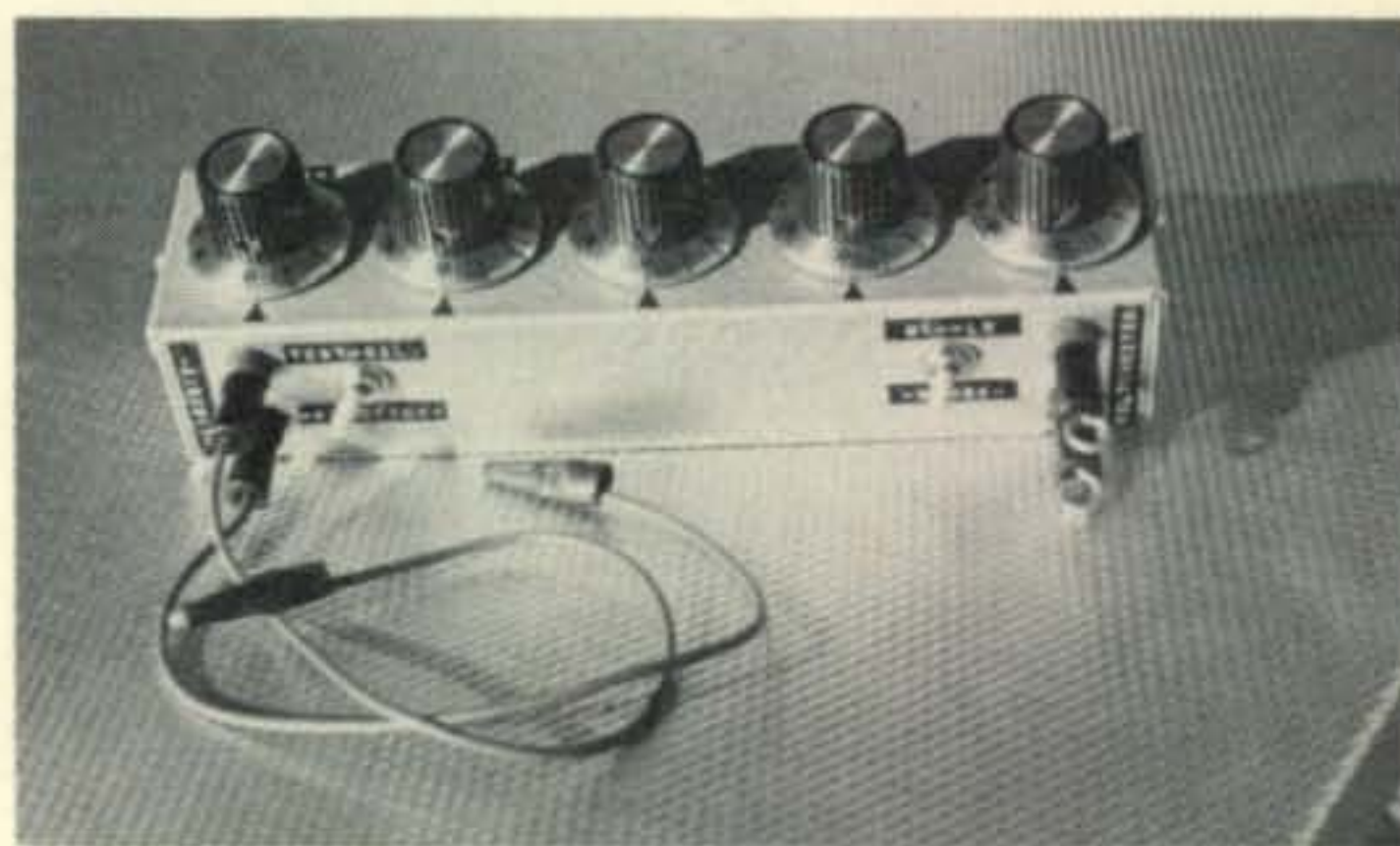
Fig. 1—Circuit of the Resistor-Rite, a simple decade resistance substitution box using five linear taper potentiometers.

Dial-type knobs reading zero to ten are used, but only for setting approximate resistance values. The final value is determined with the v.o.m.

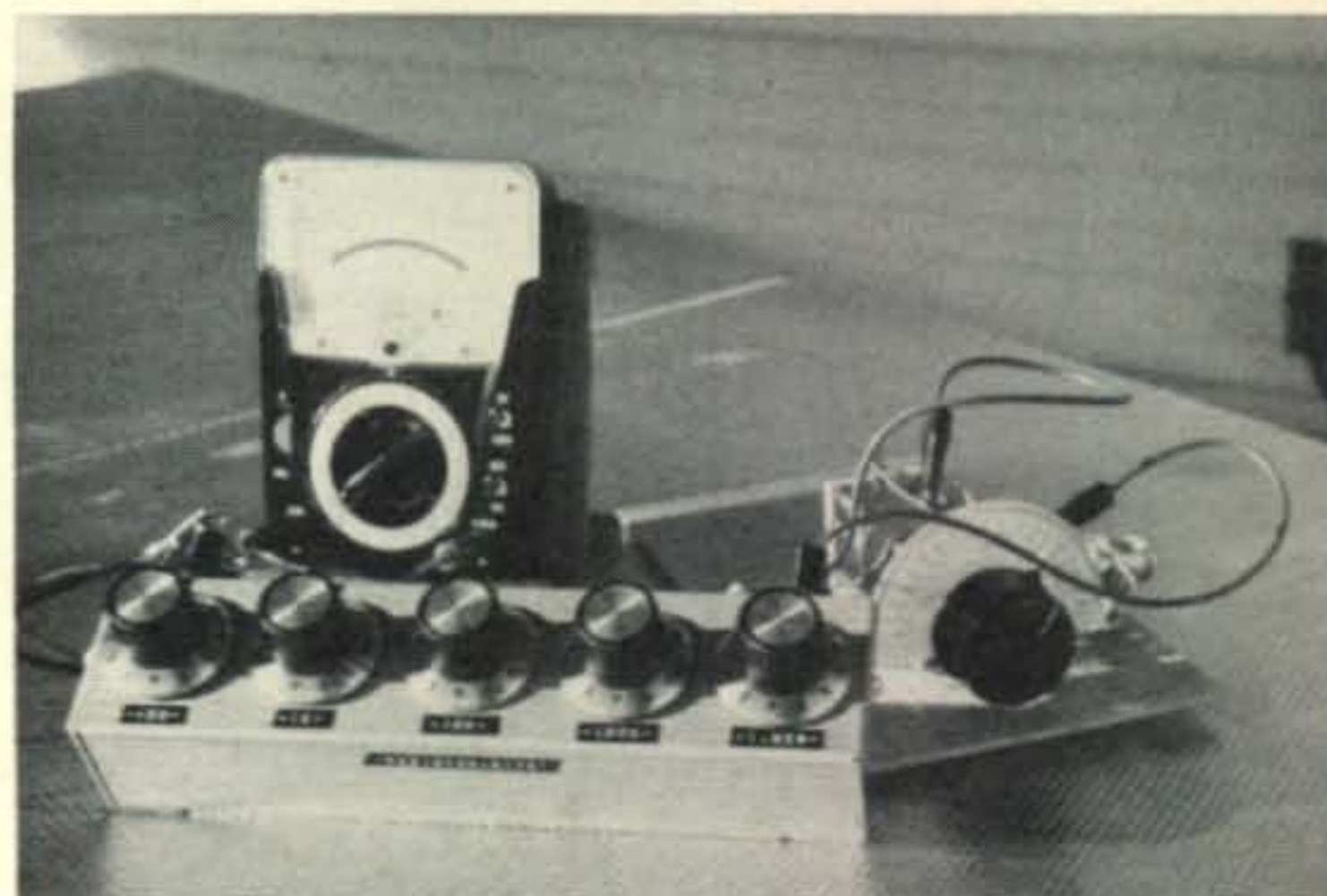
Operation

To use, the circuit clips are applied to the device under test with the FUNCTION switch in the TEST position. A v.o.m. is then connected to the v.o.m. terminals on the Resistor-Rite. When the optimum resistance value has been determined the FUNCTION switch is turned to the CAL position and the v.o.m. reads the selected resistance value.

[Continued on page 90]

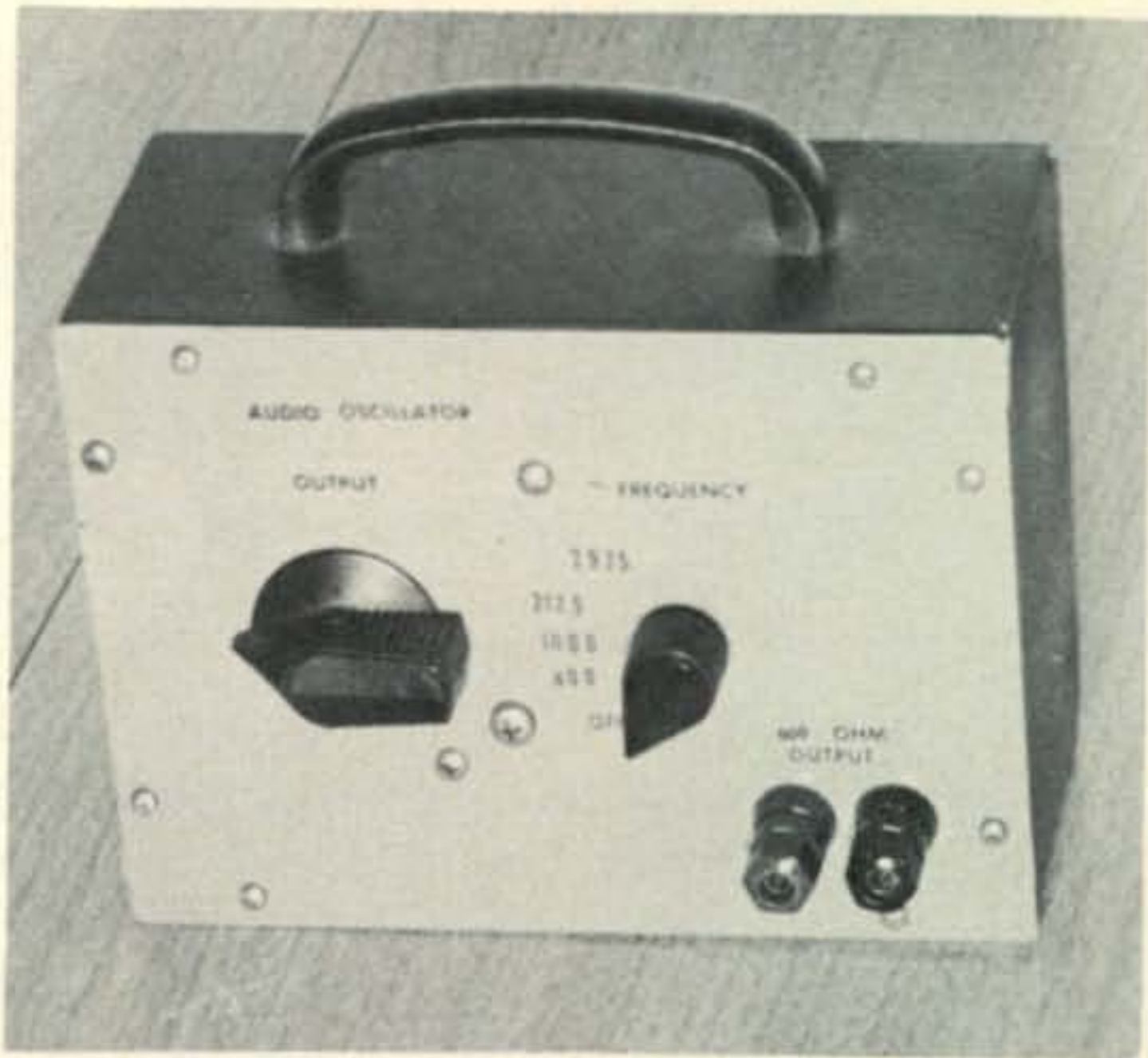


The Resistor — Rite decade resistance substitution box using five inexpensive linear taper potentiometers to provide resistance values of from 0 to over 1 meg. Photo below shows the unit in use, in conjunction with a v.o.m. as described in the text.



A Simple Audio Test Oscillator

BY SAM KELLY,* W6JTT



A completely self-contained source of audio test tones useful for testing and aligning equipment varying from audio amplifiers to teletype terminal units.

AUDIO oscillators are seldom found in even well equipped ham shacks. This is surprising since they are one of the most useful pieces of test equipment. The oscillator described here isn't fancy, but it is adequate for checking distortion, gain and the Teletype mark and space frequencies. The output level is continuously variable by a potentiometer. The output impedance is 600 ohms from an emitter follower. Four pre-set frequencies are available: 400 c., 1000 c. 2125 c., and 2975 c. If you aren't interested in RTTY, the last two frequencies could be omitted or changed to frequencies of interest.

The circuit consists of an R-C phase shift oscillator driving a Darlington pair emitter follower. The Darlington pair provides a high impedance load for the oscillator and a stable 600 ohm output impedance. The entire unit was built in a 5 x 7 x 3 inch chassis. All components except for the battery are mounted directly to the panel. The battery is clamped to the side of the box.

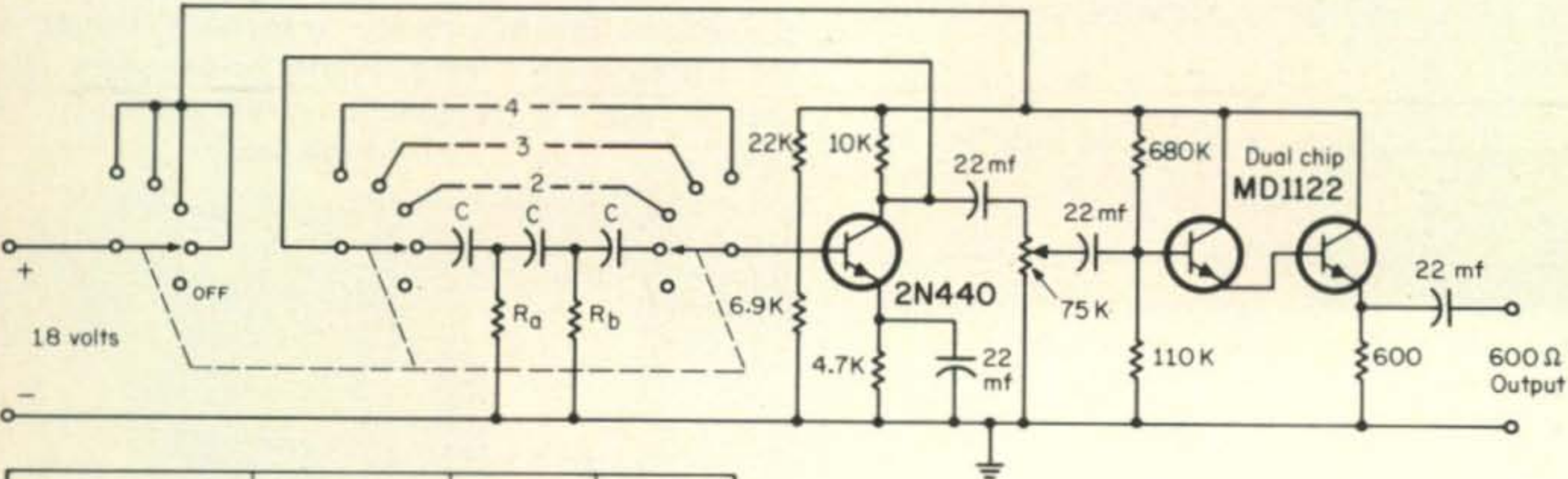
Figure 1 is the schematic. No special precautions are necessary in wiring the unit. All components except for the phase shift networks and switches, were mounted on a small piece of Vector board. The phase shift networks are mounted directly to the wafers of the switch.

Output is taken across the 600 ohm emitter resistor of the emitter follower. A blocking capacitor provides d.c. isolation of the output. Four completely separate R-C phase shift networks were used. This permits trimming to the exact frequency with small trim-pots.

In the event that frequencies other than those shown are desired the new values of

*12811 Owen St., Garden Grove, Cal. 92641

[Continued on page 90]



Frequency (cps.)	C	R _a	R _b
400	0.016 mf	10 K	10 K
1000	6400 mmf	10 K	10 K
2125	3000 mmf	12 K var.	10 K
2975	2200 mmf	12 K var.	10 K

Fig. 1—Circuit of a simple audio test oscillator. Values for C, R_a and R_b are listed for various frequencies.

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A50-5	6 meter, 5 element	29.50
A50-6	6 meter, 6 element	39.50
A50-10	6 meter, 10 element	59.50

CUSH CRAFT SQUALO

ASQ-2	2 meter, 10" square	\$11.95
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ASQ-6	6 meter, 30" square	15.95

CUSH CRAFT BIG WHEEL

ABW-144	2 meter, gain	\$13.95
---------	---------------	---------

CUSH CRAFT DX-ARRAY

DX-120	2 meter, 20 element	\$29.50
DX-220	1 1/4 meter, 20 element	22.50
DX-420	3/4 meter, 20 element	17.50

CUSH CRAFT RINGO

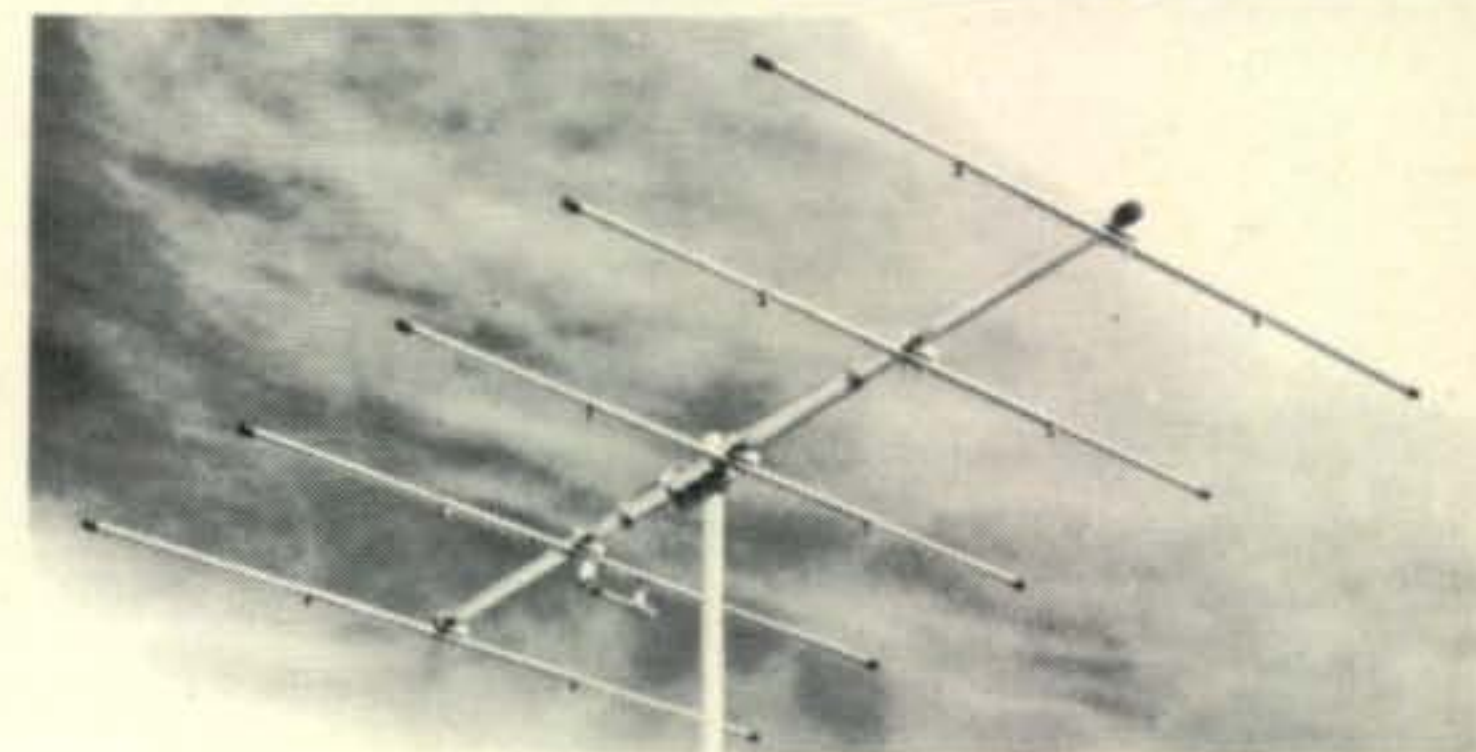
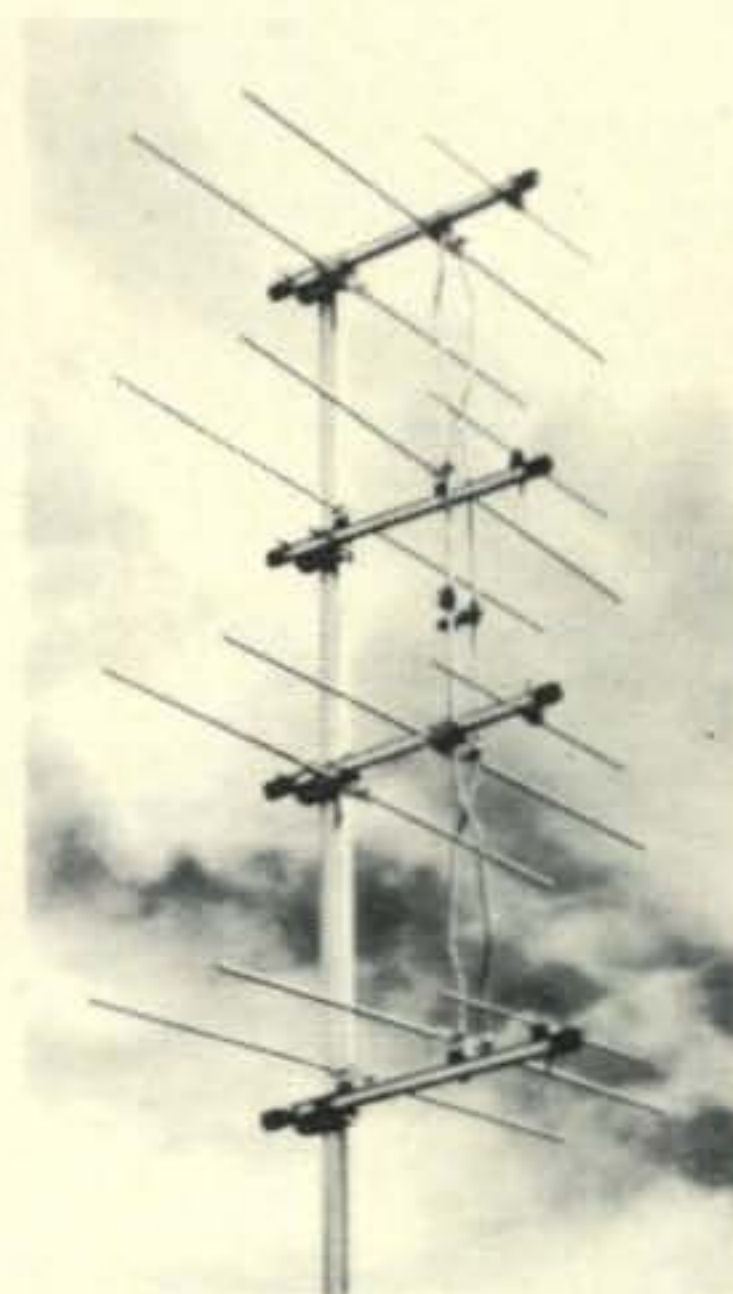
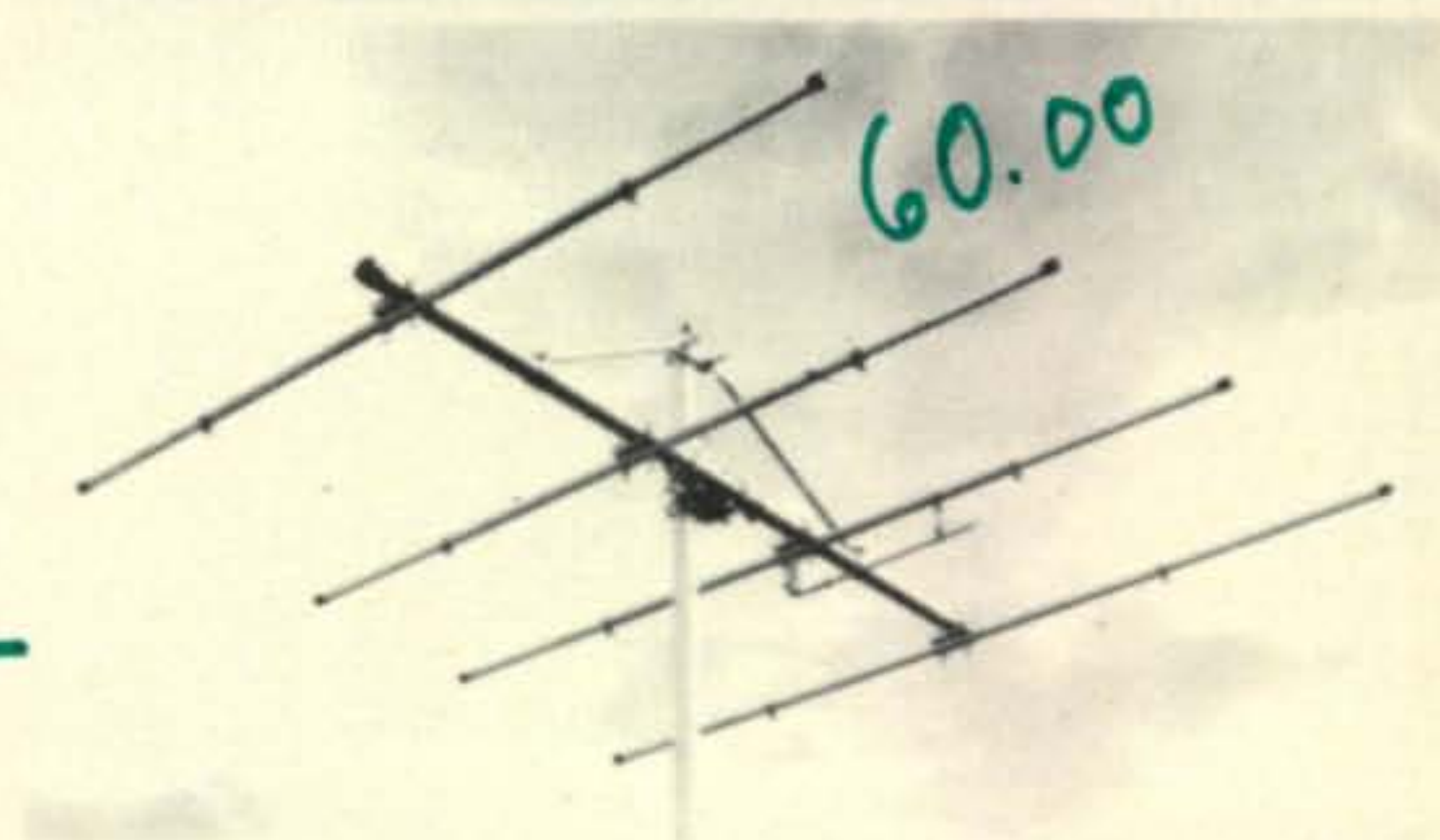
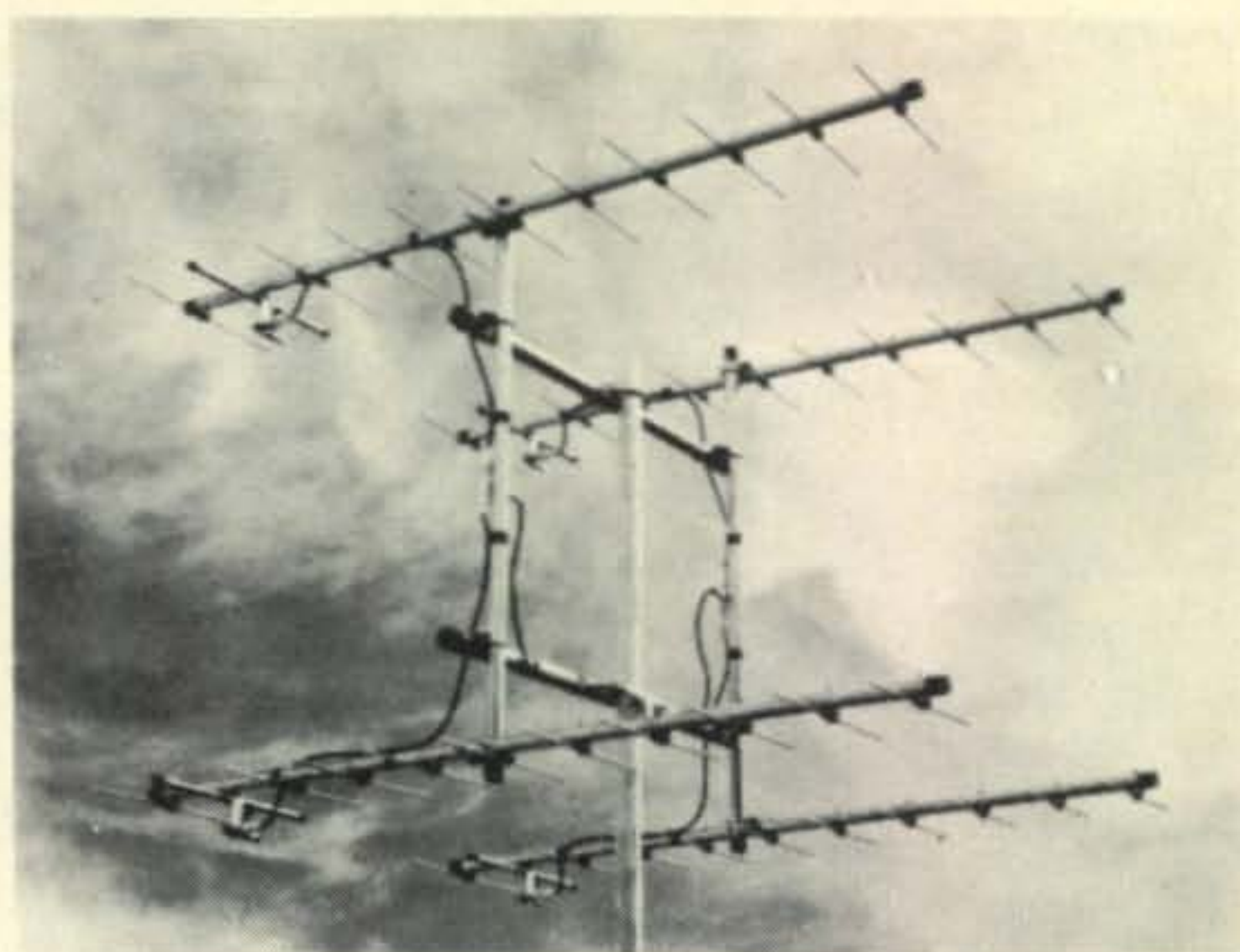
AR-2	2 meter, gain	\$12.50
AR-6	6 meter, gain	18.50

CUSH CRAFT BLITZ BUG

LAC-1	Lightning Arrester	\$ 3.95
LAC-2	Lightning Arrester	4.45

CUSH CRAFT MONOBEAMS

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A21-4	15 meter, 4 element	79.95
A28-3	10 meter, 3 element	39.95
A28-4	10 meter, 4 element	49.95



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CQ World-Wide DX Contest

ALL-TIME PHONE RECORDS

In the records listed below, boldface listings denote world records. Number groups after calls are: year of operation, total score, contacts, countries

Single Operator/Single Band

WORLD RECORD HOLDERS

1.8 VE3BS ('69)	1,947	74	6	5
3.5 YV5BTS ('66)	69,471	296	21	62
7.0 SM5BPJ ('69)	138,061	622	30	91
14 PY4OD ('69)	919,068	1723	39	135
21 CW0AA ('69)	1,068,552	2377	36	117
28 YV1LA ('68)	664,560	1898	33	87

AFRICA

1.8 No Entrant				
3.5 No Entrant				
7.0 ZS6DW ('69)	1,144	20	12	14
14 CR6IK ('69)	742,755	1542	38	131
21 ZD8WZ ('66)	378,200	1076	31	91
28 EL2J ('68)	275,296	829	31	80

ASIA

1.8 No Entrant				
3.5 4X4AS ('64)	29,392	227	11	33
7.0 JA2BTV ('67)	46,620	196	29	55
14 UA9DN ('69)	699,105	1478	39	126
21 JA1RJW ('69)	379,136	1197	37	91
28 4X4JU ('69)	570,836	1522	34	99

EUROPE

1.8 GM3YCB ('69)	1,080	90	2	10
3.5 ON4UN ('66)	61,523	616	19	58
7.0 SM5BPJ ('69)	138,061	622	30	91
14 G5AAM ('67)	824,344	1634	39	144
21 G3HCT ('69)	832,016	2124	37	112
28 DL4PM ('68)	614,544	1858	34	84

NORTH AMERICA

1.8 VE3BS ('69)	1,947	74	6	5
3.5 W1FZJ/KP4 ('68)	50,410	297	18	35
7.0 VE3KZ ('69)	92,442	610	20	57
14 KP4AST ('69)	619,714	1760	36	116
21 VE3MR ('69)	550,212	1292	39	117
28 W2SKE ('68)	429,976	1030	34	108

OCEANIA

1.8 No Entrant				
3.5 KH6EPW ('66)	5,040	82	10	11
7.0 ZL1AGO ('68)	13,896	134	17	19
14 KX6BQ ('65)	449,306	1125	36	107
21 KH6BZF ('68)	290,628	1382	27	42
28 KG6AQY ('69)	435,528	1558	31	61

SOUTH AMERICA

1.8 No Entrant				
3.5 YV5BTS ('66)	69,471	296	21	62
7.0 YV4UA ('68)	97,605	414	20	61
14 PY4OD ('69)	919,068	1723	39	135
21 CW0AA ('69)	1,068,552	2377	36	117
28 YV1LA ('68)	664,560	1898	33	87

Single Operator/All Band

AF ZD8Z ('68)	4,184,680	3210	122	327
AS VS6DR ('69)	1,913,680	2239	119	261
EU LA0AD ('69)	2,512,692	2425	110	271
NA KV4FZ ('69)	4,180,500	3725	136	364
O VK2ADY/9 ('67)	5,045,115	3310	153	384
SA 9Y4AA ('69)	4,318,925	3056	130	355

WORLD RECORD

Station	Band	Contacts	Zones	Countries
VK2ADY/9 (1967) 5,045,115	1.8	—	—	—
	3.5	29	15	20
	7.0	118	25	37
	14.0	949	38	110
	21.0	1084	38	104
	28.0	1130	37	113
Total		3310	153	384

Multi-Operator/Single Trans.

AF CR6CA ('68)	2,481,248	2371	99	272
AS UA9KAX ('69)	3,673,969	2378	131	402
EU ON4UN ('69)	5,117,716	3339	149	408
NA W4AXE ('69)	2,929,552	1835	144	410
O KH6SP ('69)	1,898,546	2751	95	179
SA CW3BH ('69)	3,944,460	3523	121	268

WORLD RECORD

Station	Band	Contacts	Zones	Countries
ON4UN (1969) 5,117,716	1.8	—	—	—
	3.5	143	18	55
	7.0	208	23	54
	14.0	1177	39	129
	21.0	1138	35	95
	28.0	673	34	75
Total		3339	149	408

Multi-Operator/Multi-Trans.

AF ZS5JY ('69)	3,979,346	3126	127	307
AS XW8CS ('69)	1,806,847	2032	109	250
EU OH5SM ('69)	11,593,925	6771	153	526
NA PJ0MM ('68)	7,037,658	6406	134	343
O KX6AF ('58)	306,642	711	59	88
SA PJ0DX ('69)	17,613,400	9270	156	488

WORLD RECORD

Station	Band	Contacts	Zones	Countries
PJ0DX (1969) 17,613,400	1.8	36	4	8
	3.5	452	22	60
	7.0	929	24	70
	14.0	2739	39	146
	21.0	2699	35	116
	28.0	2415	32	88
Total		9270	156	488

CQ World-Wide DX Contest

ALL-TIME C.W. RECORDS

zones, and countries. All-band and Multi-Operator records include a band-by-band breakdown of the world leader in each category.

Single Operator/Single Band

WORLD RECORD HOLDERS

1.8 ZC4RB ('67)	4,335	86	3	14
3.5 UC2AA ('66)	83,496	714	20	64
7.0 5A1TW ('64)	227,814	918	22	64
14 1G5A ('66)	792,370	1594	37	133
21 CR6GO ('68)	530,550	1409	37	94
28 PY2SO ('67)	532,956	1319	37	101

AFRICA

1.8 No Entrant				
3.5 No Entrant				
7.0 5A1TW ('64)	227,814	918	22	64
14 1G5A ('66)	792,370	1594	37	133
21 CR6GO ('68)	530,550	1409	37	94
28 CR6IK ('69)	498,800	1439	36	80

ASIA

1.8 ZC4RB ('67)	4,335	86	3	14
3.5 4X4DH ('64)	55,440	301	14	49
7.0 4X4FA ('64)	174,505	781	25	60
14 HL9KH ('63)	339,920	910	37	103
21 JH1EYB ('68)	188,034	585	36	75
28 HZ1AB ('68)	132,390	578	21	55

EUROPE

1.8 OK1ZC ('64)	3,060	167	5	15
3.5 UC2AA ('66)	83,496	714	20	64
7.0 SM5BLA ('69)	168,590	550	32	83
14 SM4CMG ('69)	254,600	831	37	97
21 G3HCT ('68)	240,468	848	32	84
28 DL4AAP ('57)	253,680	728	36	84

NORTH AMERICA

1.8 VO1FB ('66)	4,165	92	4	13
3.5 W1SWX ('68)	35,309	188	18	49
7.0 W6AM ('64)	161,991	468	37	86
14 W4AXE ('68)	396,414	836	39	123
21 W4KFC ('66)	211,106	609	32	87
28 K1JGD ('68)	158,510	520	28	82

OCEANIA

1.8 VK5KO ('64)	6	1	1	1
3.5 VK3APN ('69)	8,904	130	11	17
7.0 VK5NO ('69)	87,542	411	26	48
14 VK3APJ ('67)	422,240	1150	35	95
21 K1FNA/KG6 ('68)	380,064	1157	32	79
28 VK8UG ('67)	320,008	1048	32	72

SOUTH AMERICA

1.8 PY2BJH ('68)	99	6	4	5
3.5 PJ2VD ('68)	18,704	225	10	18
7.0 PY4AP ('64)	81,673	421	22	45
14 PY4OD ('68)	747,410	1621	39	116
21 PY4SO ('68)	479,385	1211	38	97
28 PY2SO ('67)	532,956	1319	37	101

Single Operator/All Band

AF 5H3KJ ('69)	1,727,415	1703	110	235
AS HL9KH ('62)	1,142,748	1554	103	221
EU OH5SE ('69)	1,419,186	1374	124	298
NA KV4FZ ('69)	2,719,152	2867	127	287
O VR2EW ('65)	2,499,536	2215	126	268
SA 9Y4AA ('69)	3,088,968	2623	123	279

WORLD RECORD

Station	Band	Contacts	Zones	Countries
9Y4AA (1969) 3,088,968	1.8	—	—	—
	3.5	128	12	23
	7.0	373	23	44
	14.0	603	30	77
	21.0	819	32	74
	28.0	700	26	61
Total		2623	123	279

Multi-Operator/Single Trans.

AF ZS5QU ('67)	1,615,350	2005	94	181
AS 4L3A ('67)	3,084,536	2376	116	330
EU DLØKF ('68)	1,969,830	2329	128	302
NA TGØAA ('67)	1,948,360	2615	116	219
O VK5NO ('63)	945,248	1199	86	185
SA CX2CO ('66)	2,199,694	2278	104	225

WORLD RECORD

Station	Band	Contacts	Zones	Countries
4L3A (1967) 3,084,536	1.8	—	—	—
	3.5	306	13	49
	7.0	472	23	64
	14.0	604	31	88
	21.0	425	26	63
	28.0	569	23	66
Total		2376	116	330

Multi-Operator/Multi-Trans.

AF ET3FMA ('67)	1,387,680	1476	105	231
AS 4X9HQ ('62)	1,681,988	1975	84	224
EU OH2AM ('68)	4,118,688	3277	155	412
NA W3MSK ('68)	4,560,038	2696	166	423
O KG6FAE ('57)	691,601	1321	76	105
SA PJØCW ('69)	9,333,884	6636	141	335

WORLD RECORD

Station	Band	Contacts	Zones	Countries
PJØCW (1969) 9,333,884	1.8	55	6	8
	3.5	478	15	33
	7.0	1296	26	63
	14.0	1981	32	85
	21.0	1569	32	76
	28.0	1257	30	70
Total		6636	141	335

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SC550 Speaker Console with headphone jack for GT550 transceiver. AC400 power supply will mount inside console.

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AC400 Power Supply is a heavy duty solid state supply to operate the GT550 at full power, on SSB or CW, and with switch selection of 115/230 VAC, 50/60 Hz input voltages. Wires cable/plug for the GT550.

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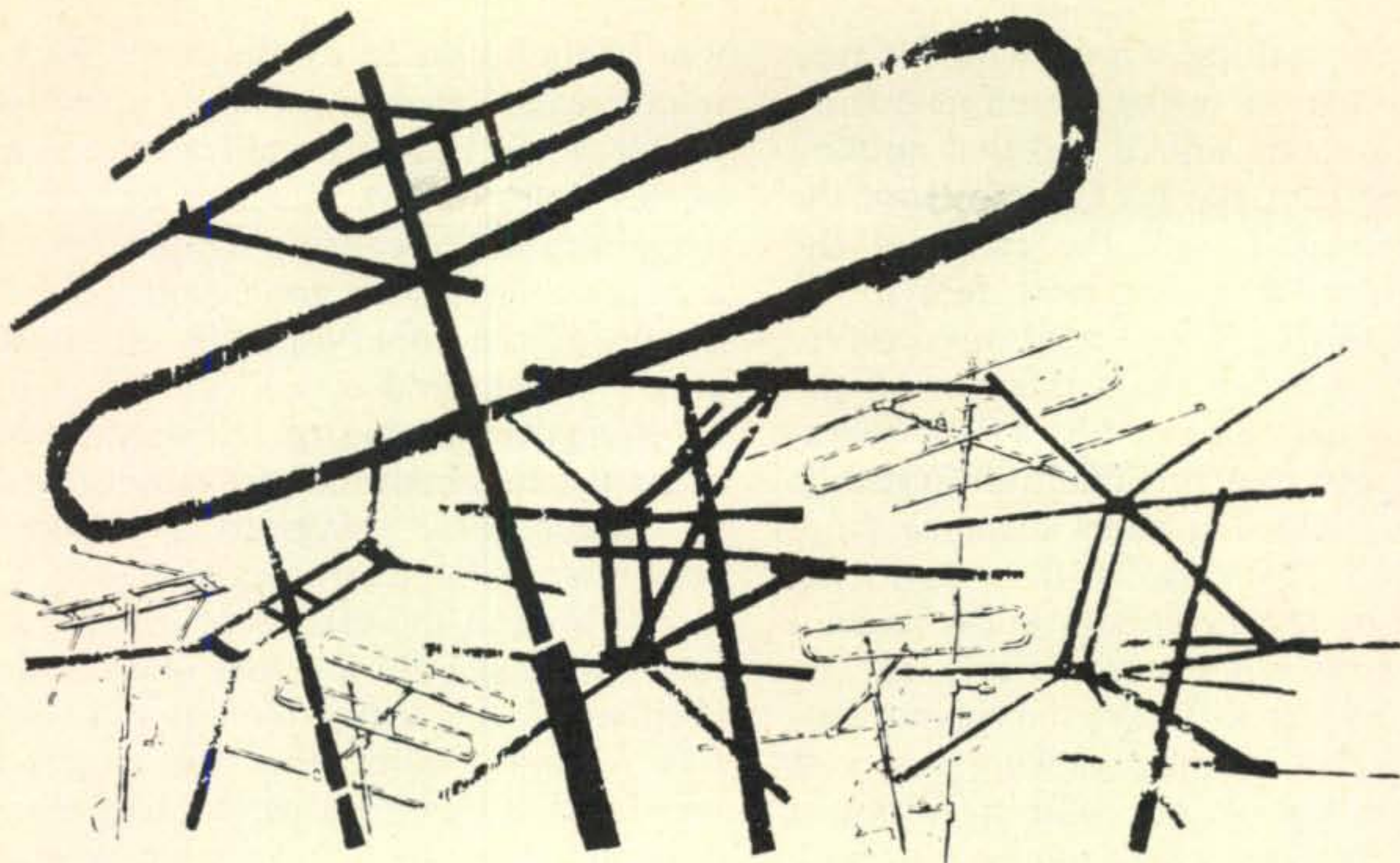
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THE CASE OF THE ELUSIVE TVI

BY GLEN W. HOWARD, W5BWV

KNOWING that all amateur radio operators are always alert for articles dealing with the problems of TVI and ways other hams have solved their problems is the reason for this article dealing with a case that remained unsolved for a long time but was finally brought to a happy conclusion by those interested.

Our troubles began about a year before. In using the word "our" I am referring to the southwestern area of a city of some 12,000 people and the particular area affected by the problem of TVI covering about three city blocks in width by some ten blocks in length. The problem was one of moderate to heavy interference depending on where a family lived in the area and whether the family was connected to the local cable TV system or used an outside antenna.

In this area of Southeastern New Mexico we get good reception from three TV channels using antennas or about nine channels if connected to the cable system. Channels available without cable are 6, 8 and 10. Channel 6 is in Carlsbad, while both the others are located in Roswell. These stations run medium to full power and normally give good video as our city is located at almost the exact half-way point between the other two cities.

Being an amateur radio operator and more inclined to keep an eye opened for interference, I was one of the first to become aware of the fact that a bad TVI problem was developing in this vicinity. I later found out that my location was in the fringe area of the problem and that the families located in a westerly direction from me had more serious problems with the interference than I. Naturally, with dipole antennas for 80 and 40 meters and a vertical trap-job for the higher frequencies, my house was picked out by some of those in the neighborhood as the cause of the interference problem. The same old story that has been heard by many other amateurs, I am sure.

The interference we were experiencing was in the video section on channel 10 and none of the other channels were affected. No audio problems on this channel at my location but others has serious audio interference as well as video. I had tested my equipment with my own two TV sets and had assured myself that my equipment was clean as far as TVI was concerned.

About this time my next-door neighbor purchased a new color TV set and settled down for some really enjoyable programs. What a sad disappointment he encountered! After about the third service call in as many weeks he was informed by the TV service-

*1808 Sears Ave., Artesia, New Mexico 88210

man there was nothing wrong with his new color set and that the problem stemmed from an unknown outside source and that nothing could be done to make his color picture the way he expected it until the cause of the trouble was located. Living next door to my place and knowing I operated my station almost daily, he asked the serviceman if the interference could be caused by a ham operator. He was told that this could be possible. My shack is located a short distance from the house and connected with a patio between. Most of the neighbors know when I am operating my rig, especially at night, by the lights in my shack. I have the rig on regularly in the early evening viewing hours as I check into a couple of traffic nets almost nightly. One evening I was unable to check in with the traffic nets and the XYL and I were enjoying our dinner. The telephone rang, and I, being in easy reach answered it. In a surprised voice the next door neighbor, the one with the new color set, asked me if I had my station on the air. I told him that I did not and that we were in the process of eating. I asked what the reason was for the inquiry and was informed by him of just what the serviceman had told him was a possibility. I told the neighbor that we were having the same interference problem at our house. He was very sorry for his accusation and I made an appointment to test my equipment with him which proved that my station was not his trouble. Deciding at this point that someone had to get busy and get the trouble located and remedied, I started out by discussing the problem very thoroughly with the TV servicemen in our town and am glad to say that all of them were very interested in helping to get to the bottom of our problem. One of the servicemen told me that he had suggested to his customers that a letter of complaint to the channel 10 station would very likely get results. Several complaints were sent out from this immediate vicinity and the TV station proceeded to send engineers with proper testing equipment but, ironically, they came in daylight hours and the problem seemed to be mostly at nights and on the week-ends. Nothing was located at the time of their visits and all they could do was to express their concern in the matter.

About this time another factor became involved in the problem. One of the neighbors, I'll call him "Bill," decided to get a CB rig and proceeded to put up a nice CB antenna. Bill's home is located in the area that

was being bothered by the worst part of the interference problem, and, although the problem had been around for several months at this time, Bill was accused by some in the neighborhood of causing the problem. (Folks are funny mortals; don't you agree?). Bill is one of the supervisors in our local telephone system and is well educated in most all things pertaining to telephone work. By being tactful about the problem it is still hard to explain these things to a person whose only interest in electronics is a good TV picture. Through the efforts of my TV serviceman, Bill and I got together and decided that if either of us wanted to enjoy our respective rigs without feeling that the neighborhood was looking down on us, we had better prepare ourselves to finding what was causing all that TVI!

By making note of the beginning and ending times of the interference we had almost definitely come to the conclusion it was from a radiating TV set. Almost everytime the interference began or ended on our screens was at program changing times for the station.

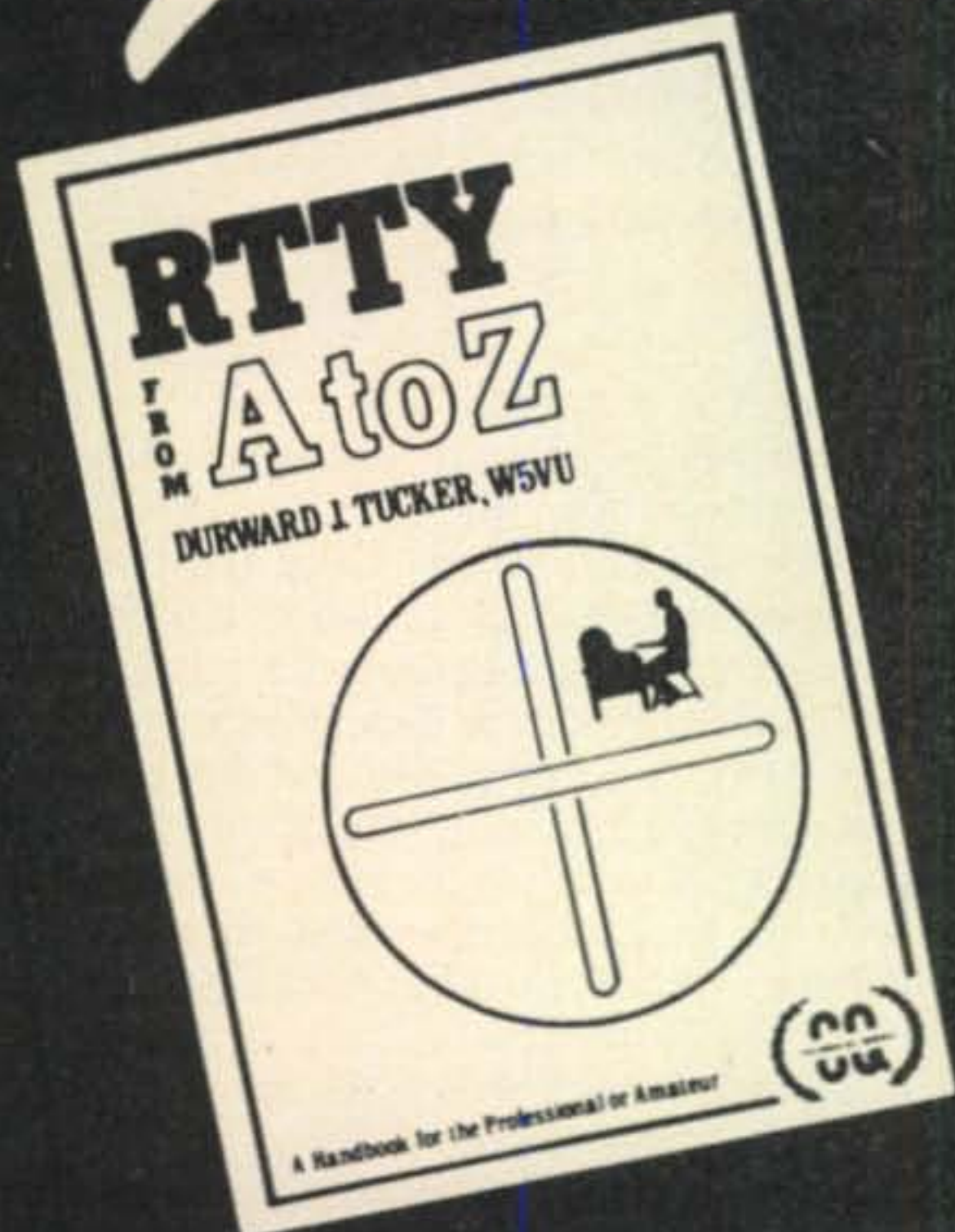
Bill had a portable TV that could be used on battery power. He put a small TV antenna on his car and drove by my house one night and informed me that he was ready to locate who or what was causing the problem if I would go with him to assist. I gladly consented and we started out cruising the streets in the immediate vicinity of our homes. We both live on the same street. We covered three streets in a southerly direction from where we lived. Bill did the driving and I held the small portable where we could both watch it. We had a little problem with ignition interference, but by stopping the car motor this was eliminated when we wanted to be sure. We decided we were headed in the wrong direction from our homes for the problem grew less. We then proceeded to cover the streets in the opposite direction. At a point on one of the streets the small portable set completely lost the picture on channel 10 and the audio was only slightly audible. This seemed to be the right place to start the slow process of knocking on doors and finding out who had their TV set going and which channel they were watching. Bill proceeded to the door knocking while I remained in the car to watch the portable set. We agreed on a system whereby I would sound three short blasts on the car horn when the picture cleared up. After trying about

[Continued on page 94]

years in the making

RTTY FROM AtoZ

DURWARD J. TUCKER, W5VU



Drawn partly from the pages of **CQ**, and partly from previously unpublished material, this new RTTY classic has been produced to fill the void in RTTY knowledge among amateurs and professionals alike.

Written to round out the amateurs' RTTY bookshelf which up to now has relied solely on another **CQ** classic: "The New RTTY Handbook," the combination of the two is unbeatable. To properly describe the scope of this volume would demand a volume in itself, but the chapter headings below tell the story:

Chapter 1—RTTY Basics. Chapter 2—The Teletypewriter. Chapter 3—Teletype and Radio Reception. Chapter 4—Converter (Terminal Unit) Basics. Chapter 5—Polar Relays and Distortion. Chapter 6—Special RTTY Circuits. Chapter 7—Test Sets. Chapter 8—Machine Adjustments. Chapter 9—Tape Printers. Chapter 10—Kleinschmidt Machines, Tape Readers, Teletype Models 28 and 32. Chapter 11—Codes, Data Processing & Advanced Machines. Chapter 12—Distortion Producing Test Sets. Chapter 13—Regenerative Repeaters and Frequency Shift Monitors. Chapter 14—Terminal Units. Chapter 15—The RTTY Station. Chapter 16—FCC Rules, Operating Procedures.

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BY JOHN A. ATTAWAY,* K4IIF

HAVING just returned from a 3-week trip to parts of Zones 14 and 15 we are impressed more than ever by the worldwide bond of friendship between DXers of all nations. It can be truly said that an active DXer need never feel himself a stranger anywhere. The XYL and I found friends waiting everywhere we stopped, and we are very grateful for their kindness and hospitality. We particularly want to thank CT1OF in Lisbon, all the 4U1ITU gang (International Amateur Radio Club) in Geneva, and I1AMU, I1LLZ, I1ZV, HV3SJ, and HV1CN in Rome and Vatican City. This is certainly a fine hobby enjoyed by some very fine people.

One can't possibly come up with enough words of praise for Gus Browning, W4BPD. At the time of this writing the old master is again risking life and limb to put the rare Indian Ocean Countries on the air. The CQ DX Committee made him the first recipient of its DX Hall of Fame award 3 years ago, but there should be a special award for Gus alone. He combines the best virtues of both the new south and the old south in one man.

*P.O. Box 205, Winter Haven, Fl. 33880



One of the top signals from Korea radiates from HM4FA. Now you see the reason why. (Photo courtesy W4LRN.)

De Extra

Most everyone dreams of operating from a rare overseas location as part of a vacation trip. Many attain it, but for many others it becomes a nightmare when they find they haven't planned adequately. The following information sent to us by Jay, K4ZLE, is must reading for those with DXpedition — vacations in mind:

"Having recently returned from a vacation/DXpedition to Europe I would like to pass the following information to anyone contemplating doing the same thing. In all likelihood, the amount of pleasure derived from your trip will be in direct proportion to the amount of preparation you have made. Start planning as soon as you think you *might* make a trip. The importance of proper prior planning cannot be over emphasized, for every day you spend looking for the someone who can issue you a license once you arrive in that country is a day you could be operating or showing the XYL that the trip isn't just a DXpedition. I started a month and a half in advance and still had no replies from licensing authorities before I left.

"Your number one objective should be to determine who issues the licenses where you want to operate. As for suggestions on how this information can be ascertained, try writing the following parties: ARRL, the national radio club of the country, or the country's QSL bureau. A good way to get information is to write an indigenous ham, set up a sked, and talk to him on the air. I find the locals are more than happy to help; many times going far out of their way to help get you through customs and set up with a minimum of delay. Jean, 3A2BF, is one such local, and a couple of Malta hams almost had me on the next plane after my operation in Monaco. Do not overlook the possibility of writing a previous expedition; after all they have first hand experience, and can probably give you the straightest information.

"When writing for the license itself, write in the native language if at all possible, and enclose IRCs. This will certainly hasten an answer. Send enough postage for Air Mail reply; that side wheeled steamer they use for mail runs takes half an eternity to cross the ocean.

"Do not expect to show up at the licensing office and get your ticket immediately. Although some countries will do this, one I attempted to operate from would not issue me a license because I had not written a request at least two weeks prior, and I was informed that if I were to make a request at that time it would be two weeks before I could have my license. Mind you this was a one room operation where everything is handled. The actual licensing process takes no longer than fifteen minutes. At that, two weeks is not unreasonable when you consider our FCC requires sixty days for reciprocal license processing.

"On crossing international borders be prepared to pay a refundable deposit on your equipment to insure against your selling it to a local before you leave the country. In this manner they are assured of collecting the import duty. The amount of this deposit varies from country

to country, with some requiring one and others not. Of course, there are some countries where you cannot bring ham gear in at all legally, but I doubt if you would want to attempt operation from them anyway. I was unprepared for this deposit and consequently lost a full day's travel through complications that arose.

"Carry your gear as inconspicuously as possible to minimize border crossing problems. I suggest putting it in regular suitcases. Large or odd shaped containers only tend to draw the border guard's attention. While the big grey box containing my equipment drew more than a cursory glance from the border patrol, not once were my regular suitcases opened, with the exception of U.S. customs. Do not volunteer telling anyone at the border station you have a transmitter. In many countries a license is required for a *receiver*; if you tell them you have a *transmitter* be prepared to instantly become a very popular person!

"I hope this information is helpful to some and while you are at the other end of the pileup listen for me.
K4ZLE"

Some Notes on QRP DX, de Bob, K4OCE

I'm very happy to have this opportunity to let others know the fun of QRP. Ironically, though it took me 95 days to work 100 countries the first time with 1000 watts, I did it the 2nd go-round with only 7 watts in 83 days.

In the adjacent photo you can see some of my QRP rigs. The smallest shown, in the $3\frac{1}{2} \times 2 \times 1\frac{1}{2}$ Minibox, is the 2nd generation of the 20 meter "OCE Minirig" of which I sent diagrams to over 200 hams throughout the world. The larger transmitter, in the $5\frac{1}{4} \times 3 \times 2$ Minibox, is a 10 watt 40/80 meter rig.

Some inexpensive transistors are available now, such as the 2N3866, which are capable of 5 watts each and have a high frequency response. I usually use a 2N706 oscillator and 2N697 driver since these have all the requirements and only cost about 50¢ each.

Most DXers will admit they get S-8/9 reports from the majority of the DX they work using 1000 watts. The difference between 1000 watts and 10 watts is only 20 db or 3.3 S-units if you use the standard of 6 db per S-unit. You would therefore receive an S-5/6 if you drop from 1000 watts to 10 watts. This is a fact and you can prove it if you try. It's quite easy to work DX with QRP once you realize it. Most people have never tried, or if they did it was with a poor antenna and receiver. Once they graduate to the "big time" with high power and a good antenna most people never think of going back to QRP. I will absolutely assure you that if you



Kai, OZ4KS at the controls of the E.D.R. club station in Copenhagen, see "Amateur Radio in Denmark." (Photo via Susanne Felbo.)

put a 10 watt rig on your big beam, point it toward Europe, and call CQ DX—HR QRP 10 WATTS DE—you will have 2 or 3 respond. Every time you get on the air many stations around the world will hear your signal. Give them a reason to respond, such as QRP, and you'll hear from them. I've personally had pileups of 8 or 9 stations.

I'm sure QRP will be fun for many DXers who have reached the high 200 mark and are beginning to lose interest due to lack of new ones. 5BDXCC may be the answer to new interest—QRP may be the answer. How much power does it take? Ask George, ZL2AFZ, who gave me an S-2 report when I was running only 3 *milliwatts*. A very interesting



Here is a fellow considered by many to be the world's top DXer, Bob Rosier, K4OCE, of Greensboro, N.C. Bob worked 100 countries in 83 days using only 7 watts power on 20 meter c.w. His present score is 124 worked, 109 confirmed. His DX includes AP5, SU1, VQ8, ZM1, HKOTU, TA2, VQ9, JX5, and all areas of the USSR except UH8 and U18. His antenna is a homebrew 4 element quad at 38 feet. See the article below for some of Bob's thoughts re QRP vs. full power



The dream chalet of HBØCM and HBØALF during their DXpedition to Lichtenstein in Feb., 1970. (Photo courtesy W1BB.)

award is the 1000 mile/watt sponsored by the QRP Amateur Radio Club International. The Secretary is W4RNL and Awards Manager is WA8CCN.

Rare and Special Prefixes Reported Recently

BY1—**BY1PK** is reported to be QSOing non-Communist stations. Some have listed his call as **BT1PK**. QSL to P.O. Box 427, Peking, China. 14047 kc is said to be a favorite frequency.

DX—**DXØPAR** was a special station operating July 3-5 in commemoration of Phillippine independence.

JR1—The **JR** series is now being used by Japanese amateurs.

PJ4—**PJ4PS** was active from Bonaire during the International Field Day weekend.

PY9—**PY9HL** was logged in 15 meter c.w. at 2135 GMT.

PZ5—**PZ5RF** was reported on 14220 kc at 0400 GMT.

PZ7 and **PZ** —**PZITU** and **PZØITU** operated on 28 mc s.s.b. for the International Telecommunications Day Event. Several other rare prefixes were also in use, including **6YØ**, **9J3**, **5T2**, **4U7**, and **HT2**, all with the suffix **ITU**.

TCØ—All Turkish station in Istanbul used this prefix from May 29-31, 1970 to commemorate the anniversary of the conquest of Istanbul.

TG7—This rare Guatemala prefix has been activated by **TG7WT** who was logged on 14250 kc at 2330 GMT.

WS6—**WS6DI**, a Novice in American Samoa,

WPX HONOR ROLL

The WPX Honor Roll is based on confirmed current prefixes which are submitted by separate application in strict conformance with the CQ WPX Master Prefix List. Scores are based on the current prefix total regardless of an operators all-time prefix count.

Mixed

W4OPM	Joe Hiller	975
W8LY	Michael A. Bakos	727
G3DO	D. A. G. Edwards	721
K1SHN	Chuck Banta	714
W3PVZ	Joseph M. Olnick	680
W4IC	George A. Mack	676
DL1MD	Heribert Rechl	646
W8ROC	Frederick W. Riecks	645
IISF	Serafino Franchi	643
WA5LOB	James Edwards	634
WA6EPQ	Larry Brockman	617
YU1AG	Djura Borosic	614
W8KSR	Jon Hodgins	609
W4BQY	G. B. Fisher	595
W8GMK	John Marhefka	592
WAØCPX	Edward Gray	550

SSB

W4OPM	Joe Hiller	851
W4NJF	Gay E. Milius	802
DL9OH	Karl Muller	690
HP1JC	Juan G. Chen	644
WA5LOB	James Edwards	627
K2POA	Arthur B. Johnson	624
G3DO	D. A. G. Edwards	622
W3DJZ	Arden B. Hopple	620
I1AMU	Alfonso Porretta	619
K1SHN	Chuck Banta	604
F2MO	Michel Dort	581

CW

W4OPM	Joe Hiller	825
W2AIW	Charles W. Rogers	776
VK3AHQ	Henry Denver	753
W8KPL	William W. Simpson	750
DL1QT	Helmut Baumert	744
W8LY	Michael A. Bakos	731
ON4QX	Bob Berge	682
W9FD	W. W. Johler	680
G2GM	F. D. Cawley	598
K1SHN	Chuck Banta	588
VE4OX	D. E. McVittie	579
YU1AG	Djura Borosic	569
W8GMK	John Marhefka	562
K1LWI	Wendell Boyden	550
IISF	Serafino Franchi	550

Phone

G3DO	D. A. G. Edwards	708
W3DJZ	Arden B. Hopple	654
CX2CN	Samuel C. Barreiro	574

Note: Due to the many new prefixes in the past few years the minimum WPX Honor Roll score will be increased to 600 current prefixes January 1, 1971.

operates weekends 0600-0900 GMT mostly on 21.175, but occasionally on 21.135 as well. QSL to Box 788, Pago Pago, American Samoa.

The WPX Program

S.S.B. WPX

525.....WA6JKO	529.....UT5DA
526.....XE1J	530.....UF6CR
527.....DJ9YI	531.....W2EHB
528.....VK2KM	

C.W. WPX

1036.....W8QHW	1040.....OK1AHI
1037.....JH1CXQ	1041.....OK2ZU
1038.....K4NTS	1042.....WA1JTM
1039.....W3GID	

Mixed WPX

237.....W8QHW	240.....K9KXA
238.....W6EYY	241.....WA9SUJ
239.....W2MB	

Phone WPX

194.....CR7FR

WPX Endorsements

S.S.B.: I1AMU-650, DL1MD-500, WA6-AHF - 450, WB2RLK - 450, XE1J - 400, VK2KM - 400, K7RDH - 350, W3TBF/8-250, and W2EHB-250.

C.W.: W4OPM-950, W8LY-800, K4IEX-650, YU1SF-550, UT5KDP-450, WA9UET - 400, UA4LM - 400, OK1AHI - 400, W8-QHW - 350, W1DMD - 350, W4WSF - 350, and UA6KAE-350.

Mixed: W4OPM-1100, W4LRN-950, W3-PVZ-700, DL1MD-650, W6EYY-500, and W8QHW-450.

Phone: CT1HF-700 and WA6TAX-450.

160 Meters: W8QHW, OK1AHI, and OK2-ZU.

20 Meters: K4RDU, UA4LM, and UT5HP.

15 Meters: W4WSF

Asia: UA4LM and UT5HP.

Europe: LA9TG, OK1AHI, OK2ZU, VK2-KM, WA6JVD, W8QHW, and UT5HP.

Oceania: I1AMU

For complete rules of WPX see pg. 66 of the June, 1970 issue. Application blanks may be obtained by sending a self-addressed stamped envelope to Jerry Hagen, WA6GLD, 5031 Arroway Ave., Covina, Ca. 91723.

X5-X5RRX was a special call used by the "flying Scotsman." This column has no information regarding the licensing of this prefix which appears to be in a block assigned to Mexico.

Here and There

Polar Bears Radio Club Service—This group does an outstanding job of obtaining QSL cards from east European and Soviet stations much more quickly than via the Bureaus. In addition, they publish a Russian Callbook, a DM Callbook, and an LZ Callbook, and issue several worthwhile DX Awards. For stamp



Philo, HBØCM operating from his dream QTH in a chalet high in Lichtenstein. He and Walter, HBØALF, gave many a happy 160 meter DXer a new one. Their home calls are HB9CM and HB9-ALF. (Photo courtesy W1BB.)

collectors they offer mint sets of USSR and east European stamps for less than catalog prices. If any of the above strikes your fancy write to Sven Elfving, P.O. Box 47, 87101 Harnosand, Sweden.

New QSL Services—Two new services specializing in forwarding QSL cards have recently joined the scene. These are the W9-GXR Guarantee QSL Club, 15 Kingswood Drive, Normal, Illinois 61761; and Scott's QSL Service, 1510 Lynnview, Houston, Texas 77055. The latter is awarding a trophy each month to outstanding QSL Managers and is requesting nominations for this honor. For complete details regarding the operation of these services it is suggested that you contact them directly.

RSGB QSL Bureau—G2MI will be on vacation from Oct. 10 to Nov. 7, 1970, and he requests that no cards be sent to arrive at the bureau during that time. Accumulation of mail causes a very severe problem.

Need Greenland on 5 Bands?—Harry Leggans, OX5AP, is now running a Swan 500C from Thule. He has antennas for 80-6 Meters and will be happy to sked anyone needing OX5 on 80, 40, 20, 15, 10 or even 6 if you want to try. His address is P.O. Box 12, ASI BMEWS, APO New York, N.Y. 09023.

New Publications—One of the most interesting little magazines to appear in recent years is *Ohm Magazine* published by Phil Wight, VS6DR, who is always a leading entry in the CQ DX Contests. It appears monthly and a



From left to right are Luigi, I1LLZ; Al, I1AMU; and Frank, I1ZV, three of the world's best county chasers. At the time of the photo during K4IIF's visit to Rome in June, 1970, Al and Frank enjoyed the distinction of having the only 5-band DXCC awards in any one country outside the U.S. The photo was at the shack of I1LLZ.

subscription is only \$2.00 per year. Content is heavy toward articles of DX interest plus a humor column by HS3DR who we must call on for an April fool article in future years. The address is General Post Office Box 16321, Hong Kong.

Quax, the news letter devoted entirely to 10 meters, has been recently reactivated. The new editor and publisher is Alan Taylor, G3DME, South View Road, Crowborough, Sussex, England.

"Ack" Memorial—One of the greatest contributors to DX for many years was E.C. "Ack" Atkerson, W4ECI, who passed away on March 7, 1970. The Birmingham DXers are planning a small trust fund to provide a plaque or trophy to be given each year to the amateur who has done the most to promote DX activities. Anyone wishing to make a

The S.S.B. DX Award Program

100 Countries	200 Countries
640.....W8IPA	204.....G3OLY
641.....G3OLY	205.....W1PCD
642.....W0JFO	
643.....W9KAA	
644.....DJ9NW	
645.....DJ3HJ	
646.....K0HUD	
647.....W8MXO	

For complete rules of the S. S. B. DX Award program see pg. 88 of the June, 1970 issue. Application blanks may be obtained by sending a self-addressed, stamped envelope to Jerry Hagen, WA6GLD, 5031 Arroway Ave., Covina, Calif. 91723.

The WAZ Program

S.S.B. WAZ

801.....WB2YRU 803.....W3YN
802.....I1BGJ

C.W.—Phone WAZ

2932.....W4WSF	2946.....W6GC
2933.....FO8BV	2947.....W8DUA
2934.....K4NTS	2948.....XE2IH
2935.....W0CVZ	2949.....VE3CWE
2936.....DJ8KBA	2950.....W3UH
2937.....DL9CC	2951.....DJ7MI
2938.....W9EIS	2952.....DJ6NE
2939.....W2MT	2953.....WA0NTC
2940.....W3QZA	2954.....LA8SJ
2941.....K4TAG	2955.....HA3MJ
2942.....F8CW	2956.....SP9PT
2943.....K4KJN	2957.....OK1AHI
2944.....K4GLA	2958.....OK1EV
2945.....WA7BOA	

For complete WAZ rules see pg. 64 of the June issue. Application blanks may be obtained by sending a self-addressed stamped envelope to DX Editor, P.O. Box 205, Winter Haven, FL 33880.

contribution should contact Dr. Charles B. Crow, WB4MKU, 1211 27th Place So., Birmingham, AL 35205.

Silent Key—We are sorry to report the death of George Sargenia, VE6AO, on April 19, 1970 after a long illness. George was a very active DXER, QSL Manager for XW8CS and others, and will be missed by the DX world.

XE0 Calls—The following list of XE0 calls assigned to amateurs from W6-land was furnished by Mike, K6ICS:

XE0DIA—K6DIA	XE0MSD—W6MSD
XE0DQA—K6DQA	XE0QPE—K6QPE
XE0GPU—WA6GPU	XE0SHI—WA6SHI
XE0ICQ—K6ICQ	XE0SMT—K6SMT
XE0ICS—K6ICS	XE0WHJ—WB6WHJ
XE0LE—K6LE	

QSL's should be sent to the stateside addresses.

QSL Information

The following amateur would like to volunteer as QSL Manager for a DX station: WN2-LYN, 36 Ridge St., Middletown, N.Y. 10940. AC0A/BR & /GR—Via W2MZV, P.O. Box 102, Yonkers, N.Y. 10702.

AX9KY (VK9KY)—To VK2SG, 13 Pendle Way, Pendle Hill 2145, N.S.W., Australia.

CR3KD—Not via W2CTN. Via WA4PXD. (TMX W2DTK.)

CR6GO—P.O. Box 10408, Luanda, Angola.

CR7DB—c/o CR6GO, Box 10408, Luanda, Angola.

[Continued on page 82]



Contest Calendar

BY FRANK ANZALONE,* W1WY

Calendar of Events

Sept.	12-14	Delta QSO Party
Sept.	19-21	Pennsylvania QSO Party
Sept.	19-20	SAC C.W. Contest
Sept.	26-27	SAC Phone Contest
Oct.	3-4	Missouri QSO Party
Oct.	3-5	Massachusetts QSO Party
Oct.	3-5	California QSO Party
Oct.	3-4	VK/ZL/Oceania DX Phone
Oct.	10-11	VK/ZL/Oceania DX C.W.
Oct.	10-11	RSGB 28 mc Phone Contest
Oct.	10-11	Floridora Contest
Oct.	16-18	RTTY Plaque Sweepstakes
Oct.	17-18	Boy Scouts Jamboree
Oct.	17-18	WADM C.W. Contest
Oct.	21-22	YL C.W. Anniv. Party
Oct.	24-25	CQ WW DX Phone Contest
Oct.	24-25	RSGB 7 mc C.W. Contest
Nov.	4-5	YL Phone Anniv. Party
Nov.	6-8	Delaware QSO Party
Nov.	7-8	RSGB 7 mc Phone Contest
Nov.	8	Czechoslovakian Contest
Nov.	28-29	CQ WW DX C.W. Contest

Delta QSO Party

Starts: 2000 GMT Saturday, September 12

Ends: 0200 GMT Monday, September 14

This is the first party sponsored by the Delta Division of the ARRL. Delta stations (Ark., La., Miss., Tenn.) may work stations both in and outside their boundaries, others only Delta stations. Stations may be worked each band/mode, and mobiles each county change.

Exchange: QSO nr., RS/RST and QTH. County/state for Delta, ARRL section for others.

Scoring: For Delta, QSOs times ARRL sections worked. (max. 74) Outside Delta, QSOs times Delta counties. (max. 316) DX stations have only QSO value, no multiplier.

Frequencies: 3560, 3990, 7060, 7290, 14060, 14290, 21060, 21390, 28060, 28590. Novice: 3725, 7175, 21125.

Awards: Certificates to 3 top scorers in each of the four Delta states. (min. 50 QSOs) Each ARRL section and country. (min. 10 QSOs) Three Plaques, to the Top Banana in

the Delta, outside Delta and Mobile. (min 200 QSOs)

Mobile and portables must file separate log for each county change and each will be considered a separate entry.

Mailing deadline Oct. 11th to: Malcolm Keown, W5RUB, 213 Moonmist, Vicksburg, Miss. 39180

Pennsylvania QSO Party

Starts: 2300 GMT Saturday, September 19

Ends: 0200 GMT Monday, September 21

The 13th annual party is again sponsored by the Nittany ARC. The same station may be worked on each band and mode for QSO points.

Exchange: QSO nr., RS/RST and QTH. County for Penn., ARRL section for others.

Scoring: For Penn., 3 points for out of state, 1 point for in state QSOs. Multiply total by ARRL sections and countries worked. Others 1 point per QSO multiplied by Penn. counties worked. (Max. of 67)

Frequencies: On c.w. 72.5 kc in from lower edge of each band. Phone activity on even GMT hours, 3990, 7290, 14290, 21390, 28590.

Awards: Certificates to 1st place in each ARRL section, additional awards if justified. Minimum requirements for Penn. Counties Award, 30 counties.

Mailing deadline Oct. 19th to: Nittany ARC QSO Party, P.O. Box 60, State College, Penn. 16801.

Scandinavian Activity Contest

C.W.—Sept. 19-20 Phone—Sept. 26-27

Starts: 1500 GMT Saturday

Ends: 1800 GMT Sunday

It's the world working the Scandinavians in this one, LA, JW, JX, OH, OHØ, OX, OY, OZ and SM/SK/SL on all bands 3.5 thru 28 mc. The same station may be worked on each band for QSO and multiplier credits.

Classes: Single and multi-operator. Club stations are considered multi. Simultaneous operation on more than one band is permitted but the exchange number must be in

*14 Sherwood Road, Stamford, Conn. 06905.

chronological order.

Exchange: Five or six figures, RS/RST plus a progressive QSO nr. starting with 001.

Scoring: Each completed QSO counts 1 point. The multiplier is the SAC prefixes above, max. of 9 per band. Scoring is for all band operation only.

Awards: Certificates to the two top scorers, both phone and c.w., in each country and in each US call area.

A summary sheet showing the scoring is requested, your name and address in BLOCK LETTERS, and a signed declaration that all rules and regulations have been observed.

This year logs go to: E.D.R. Contest Committee, P.O. Box 335, 9100 Aalborg, Denmark.

Missouri QSO Party

Stars: 2100 GMT Saturday, October 3

Ends: 2400 GMT Sunday, October 4

The Missouri SCM is sponsoring this year's party. A station may be worked on each band and mode, portables changing counties may be worked at each location.

Exchange: QSO nr., RS/RST and QTH. County for Mo., state, province for others.

Scoring: Mo. stations multiply QSOs by states, provinces and DX countries. Others use Mo. counties for multiplier (max. 115).

Frequencies: 3540, 7040, 14040, 21040 on c.w. 3910, 7260, 14285, 21360 on phone. Try 1810 at 0400 GMT. Avoid QRM with Net operation.

Awards: Certificates to top single operator in each state, province and DX country, and top 5 in Missouri. Also 3 multi-opr. worldwide.

Mailing deadline Oct. 31st to: Robert Peavler, WØBV, Route 4, Kirksville, Missouri 63501. Include s.a.s.e. for copy of results.

Massachusetts QSO Party

Starts: 2300 GMT Saturday, October 3

Ends: 0500 GMT Monday, October 5

This is the 6th annual party sponsored by the MIT Radio Society, W1MX. A station may be worked on each band and mode. Mass. stations may work other Mass. stations on the v.h.f frequencies, but only above 50 mc.

Exchange: QSO nr., RS/RST and QTH. County for Mass., state or province for others.

Scoring: Two points per QSO. Mass. use states and VE provinces for their multiplier. Others Mass. counties, max. of 14. (Mass.

stations operating v.h.f. *only* also add Mass. counties to their multiplier.)

Frequencies: C.W. — 3560, 7060, 14060, 21060, 28060. Phone — 3960, 7270, 14290, 21390, 28560. Novice — 3735, 7175, 21110. And the v.h.f frequencies.

Awards: Certificates to the top stations in each state, province and Mass. county.

Mailing deadline Nov. 1st to: MIT Radio Society, W1MX, Box 558, 3 Ames Street, Cambridge, Mass. 02139.

California QSO Party

Starts: 2000 GMT Saturday, October 3

Ends: 0200 GMT Monday, October 5

The North Hills R.C. is running this the 5th annual party. The same station may be worked on each band and mode, Calif. stations may work each other but for QSO credit *only*.

Exchange: QSO nr., RS/RST and QTH. County for Cal., ARRL section for others.

Scoring: Cal. multiply total QSOs by ARRL sections and DX countries worked. Non-W6s multiply QSOs by Cal. counties. (max. 58)

Frequencies: 3560, 3980, 7060, 7280, 14,060, 14280, 21060, 21380, 28060, 28580. Novices: 3735, 7175, 21110.

Awards: Certificates to winners in each of the 74 ARRL sections and DX country.

Stations planning rare county operation notify W6KYA. Novice activity encouraged.

Mailing deadline Nov. 6th to: John Minke, W6KYA, 6230 Rio Bonito Drive, Carmichael, Calif. 95608. Include s.a.s.e. for results.

VK/ZL/Oceania Contest

Phone—Oct. 3-4 C.W.—Oct. 10-11

Starts: 1000 GMT Saturday

Ends: 1000 GMT Sunday

Rules apply to stations other than VK/ZL.

Exchange: Five and six figures, RS/RST plus a progressive QSO nr., starting with 001.

Scoring: *Oceania stations:* 2 points for VK/ZL contacts, 1 point for rest of world. *Outside Oceania:* 2 points for VK/ZL contacts, 1 point for Oceania. *Final score:* Total points multiplied by sum total of VK/ZL call areas from each band. Single band scores are acceptable.

Logs: Date/time in GMT, station, number sent/rec'd, band, and QSO points. Underline each new VK/ZL call area worked on each band.

A summary sheet, name and address in BLOCK LETTERS and a signed declaration

that rules and regulations have been observed is requested.

Awards: Certificates to top scorers in each country and call areas of W/K, JA and UA, all bands and single band conditions permitting.

There is also a s.w.l. section, only VK/ZL stations are to be listed. Include call of station being worked and serial number sent.

Logs go to: Federal Contest Committee, W.I.A., Box N1002 G.P.O., Perth, W. Australia.

RSGB 28 mc Phone Contest

Starts: 0700 GMT Saturday, October 10

Ends: 1900 GMT Sunday, October 11

It's the world working the British Isles on 28 mc only. Contacts may be made on a.m. or s.s.b. and only single operator entries are acceptable.

Exchange: The RS report plus a progressive contact number starting with 001.

Scoring: Each complete QSO with a British Isle station counts 5 points. Additional bonus of 50 points for the first contact with each B.I. country/prefix. i.e. G2, GC3, GD4, GI5, GM6, GW8 etc. max. of 36. No bonus for GB contacts. There is no multiplier.

Awards: Certificates to the three leading overseas stations.

There is also a s.w.l. section. Only British Isles stations are to be logged, scoring same as above.

A summary sheet with the scoring, a signed declaration and your name and address in BLOCK LETTERS is requested.

Logs go to: RSGB HF Contest Committee, c/o M. Harrington, 123 Clensham Lane, Sutton, Surrey, England.

Floridora Party

The Floridora's, a YL organization, will be on between 0000 GMT Saturday, October 10th and 2400 GMT Sunday, October 11th.

Activity will be on s.s.b. on 3933, 7260, 14285, 21370, 28570.

Besides the regular Floridora certificate given for 10 stateside and 5 DX QSLs, there will be special awards for this party.

Send your logs before Nov. 15th to: Dorothea Seaver, W4QBY, 254 Oceanic Ave., Ft. Lauderdale, Fla. 33308.

W. W. DX Contest Addendum

Phone scores corrections: In the Top scores under 14 mc, the #2 spot should be CR6IK, not CR6LK as listed. And in the

Top USA scores it's K1PBW on 160, not K1BPW. An unavoidable omission was 5N2AAF with 163,620 points on 28 mc. His log mailed Nov. 10, 1969 was not received until July 1. How's that for mail service?

RTTY Sweepstakes

Starts: 2000 GMT Saturday, October 17

Ends: 0200 GMT Monday, October 19

This year's contest, the 10th sponsored by the CARTG, honors the Manitoba Centennial. Operation limited to 36 hours, the 12 hour non-operating period may be taken any time.

Use all bands 3.5 thru 28 mc, the ARRL country list and CPR zone map.

Exchange: QSO nr., time, zone, country.

Scoring: Two points for QSOs with stations in one's own zone, other contacts according to points listed in CPR Zone chart.

Multiplier: Each country worked on each band including one's own plus KL7, KH6, VO.

Bonus points of 100 for each VE/VO worked may be added to final score.

Final Score: QSO points X country multiplier X continents worked plus bonus points.

Awards: Certificates for two top scorers in each USA and VE districts and each country. Plus 15 Plaques and Medallions.

It is suggested you write to CARTG for log forms and CPR map/exchange table.

Logs must be received no later than Dec. 1st and go to: C.A.R.T.G., 85 Fifeshire Road, Willowdale, Ontario, Canada.

Editor's Notes

See page 33 for complete rules of the 1970 WWDX Contest. You will note the addition of 6 more Trophies. Also note the modified definition for Multi-operator Single transmitter stations. We don't mind you having more than one transmitter available but use them one at a time. (Not hop from band to band within the short period of a few minutes. We also remind clubs submitting a score that the operation of a multi-operator station must be by members *only* if the score is to be credited to the club.

And don't forget to check George Jacobs' PROPAGATION Column for his usual Contest forecast. George has a pretty high accurate average, especially for the Phone section. How about giving the c.w. boys a break this year, please?

73 for now, Frank W1WY



Propagation

BY GEORGE JACOBS,* W3ASK

THE 1970 CQ World Wide DX Contest will follow dates:

Phone section: 0000 GMT Oct. 24-2400 GMT Oct. 25

C.w. section: 0000 GMT Nov. 28-2400 GMT Nov. 29

Continuing the practice of the past twenty years, this month's PROPAGATION column contains a special forecast for use during the 1970 contest sections.

Barring the development of any sudden radio storms, DX propagation conditions during this year's contest are expected to be excellent, but possibly a bit below conditions observed during the 1967, 1968 and 1969 record breaking contest periods.

1969 Contest Critique

According to Frank Anzalone, CQ's Contest Editor, last year's CQ propagation forecasts were "right on the nose." Above normal conditions were predicted for October 25, the first day of the 1969 phone section, with normal conditions predicted for October 26. A review of contest logs and world wide propagation data indicates that actual conditions on both days varied between normal and above normal.

Normal conditions were forecast for both days of the 1969 c.w. section, November 29 and 30. Actual conditions appear to have varied between normal and slightly below normal on the 29th, and they were normal on the 30th.

This raises the nineteen year boxscore for CQ contest period predictions to 29 highly accurate, 6 partially accurate, and only 3 completely inaccurate.

Sunspot Cycle

The plateau in the decline of the present sunspot cycle continues at a moderately high level of solar activity. The Swiss Federal Observatory, the world's official keeper of sunspot records, reports a monthly mean sunspot number of 107 for June, 1970. This results in a 12-month running smoothed sunspot number of 105 centered on December, 1969. The cycle has remained practically constant throughout the entire period between April and December, 1969. On the as-

*11307 Clara Street, Silver Spring, Md. 20902.

LAST MINUTE FORECAST

October, 1970

Forecast Rating & Quality				
Days(4)	(3)	(2)	(1)	
Above Normal: 2, 6, 10, 19, 21, 26, 29				
				B-C C
Normal: 1, 3, 5, 7-9, 15, 17-18, 20, 22, 24-25, 27-28, 30				
				A-B B-C C-D D-E
Below Normal: 4, 11, 14, 16, 23, 31				
				C D D E
Disturbed: 12-13				
				D E E E

How To Use THESE CHARTS

The following is an explanation of the symbols shown above, and instructions for the use of the CQ propagation predictions:

1-Enter Propagation Charts on following pages under appropriate band and distance or geographical area columns. Read predicted times of band openings at intersection of both columns.

2-Following each predicted time of band opening is a forecast rating which indicates the relative number of days the band is expected to open during each month of the forecast period. The higher the rating, the more frequent the opening, as follows: (4) band open more than 22 days each month; (3) between 14 and 22 days; (2) between 8 and 13 days; (1) less than 7 days.

On the "Short-Skip" Chart where two numerals are shown within a single set of parenthesis, the first applies to the shorter distance for which the forecast is made, and the second to the greater distance. Note the forecast rating for later use.

3-With the forecast rating noted above, start with the numbers in parenthesis at the top of the "Last Minute Forecast" appearing above. Read down the table for a day-to-day forecast of propagation conditions in terms of Above Normal (WWV rating higher than 6); Normal (WWV rating 5-6); Below Normal (WWV rating 4); Disturbed (WWV rating less than 4). The letter symbols (A-E) describe reception conditions (signal quality, noise and fading levels) expected for each day of the month and have the following meaning: (A)-excellent opening with strong, steady signals; (B)-good opening, moderately strong signals, little fading and noise; (C)-fair opening, signals fluctuating between moderately strong and weak; (D)-poor opening, signals generally weak and considerable fading and noise; (E)-poor opening, or none at all.

4-This month's DX Propagation Charts are based upon a transmitter power of 250 watts c.w.; 1 kw p.e.p. s.s.b., or 1000 watts d.s.b., into a dipole antenna a quarter-wave above ground on 160 and 80 meters a half-wave above ground on 40 and 20 meters, and a wave-length above ground on 15 and 10 meters. For each 10 db gain above these reference levels, reception quality shown in the "Last Minute Forecast" will improve by one level; for each 10 db loss, reception will become poorer by one level.

5-Local Standard Time for these predictions is based on the 24-hour system.

6-The Eastern USA Chart can be used in the 1, 2, 3, 4, 8, KP4, KG4 and KV4 amateur call areas; The Central USA Chart in the 5, 9, and 0 areas, and the Western USA Chart in the 6 and 7 areas. The Charts are valid from Oct. 15, 1970 through Dec. 15, 1970 and are prepared from basic propagation data published monthly by the Institute For Telecommunication Sciences And Aeronomy of the U.S. Dept. of Commerce, Boulder, Colorado.

sumption that the cycle has begun to decline again slowly, a smoothed sunspot number of 88 is predicted for October and 86 for November, 1970. This is a slightly lower level of solar activity than had been observed during the contest periods of the previous three years. During the 1969 contest solar activity was recorded at a level of 105; during the 1968 contest periods it varied between 110 and 111, and during 1967 it was between 95 and 97.

This slightly lower level of solar activity is expected to result in a slight decrease in overall DX propagation conditions during the 1970 contest periods.

General Forecast

The following is a band-by-band summary of general propagation conditions that can be expected during the 1970 contest periods.

10 Meters: Good openings are expected to almost every area of the world during the daylight and early evening hours. Openings to Europe and those in a generally easterly direction should peak an hour or two before noon, while those to South America and Africa are expected to peak during the early afternoon hours. Optimum conditions to the Far East, Australasia, Southeast Asia, etc. are forecast for the late afternoon and early evening hours.

15 Meters: Excellent DX propagation conditions are predicted from shortly after sunrise through the early evening hours. For each geographical area of the world, conditions on 15 meters are expected to peak about an hour or two after they have peaked on 10 meters. Openings are expected to all areas of the world, and exceptionally strong signal levels may occur during many of them. During the early afternoon hours it should be a toss-up between 10 and 15 meters for the optimum DX band, but during the later afternoon and early evening hours, 15 meters is expected to be the best band for DX propagation conditions.

20 Meters: Generally good-to-excellent DX openings are forecast to one area of the world or another on this band, almost around-the-clock. DX conditions should peak an hour or two following sunrise, and again during the late afternoon and early evening hours. Excellent openings are predicted to many southern and tropical areas during the late evening and early morning hours as well.

40 Meters: DX openings from Europe and the east should begin during the late afternoon hours and steadily increase towards evening. Openings to almost all directions are expected during the hours of darkness with signals exceptionally strong from a southerly direction. Signals from a westerly direction are expected to peak shortly after sunrise, just before the band closes for DX propagation. During most of the hours of darkness, it should be a toss-up between 20 and 40 meters for optimum DX conditions to many areas of the world.

80 Meters: Some fairly good DX openings are forecast to several areas of the world during the hours of darkness and the sunrise period. Peak conditions are expected around midnight on signals arriving from the east, shortly before sunrise for signals arriving from either the north or south, and shortly after sunrise for signals arriving from a westerly direction.

160 Meters: DX openings to some areas of the world should be possible during the hours

of darkness and the sunrise period. Signals tend to peak at local sunrise at the more easterly terminal of a path. Because of relatively high signal absorption and the lower power levels used on this band, openings at best are expected to be weak and noisy.

For a more detailed circuit-by-circuit forecast refer to the *DX Propagation Charts* appearing on the following pages. Instructions for the proper use of these *Charts* are given in the box following the "Last Minute Forecast" at the beginning of this column.

Contest Work Plans

The *Charts* on the following pages show the times that each amateur band from 10 through 160 meters is expected to open for DX from the United States to the major areas of the world. This information can be easily reorganized into operational work plans, or schedules, to serve as propagation guides during the contest periods. Experience during previous contests has shown that such plans can be extremely useful in piling up a large number of contacts with a minimum of wasted time.

The following is an example of one of the many type of plans that can be devised. It shows, for each three hour period throughout the day, the areas of the world for which, in this example, 20 meter propagation conditions are expected to be optimum (a rating of 3 or higher in the *Charts*¹). A Western QTH has been chosen for this example, but similar plans can be devised for Central or Eastern locations, and for other bands.

Sample Single Band Operating Plan 20 Meters; Western USA QTH

Time (PST)	Areas To Which Openings Should Be Optimum
00-03	South Pacific, New Zealand, Australasia, Antarctica
03-06	Nothing really optimum. Some South Pacific, New Zealand and Australasian signals, and a few South Americans, but a good time to catch up on some sleep.
06-09	All of Europe, Eastern Mediterranean and Middle East, Far East and Asia, South Pacific, New Zealand, Australasia, and northern and central South America.
09-12	Some European, Far East and northern South Americans, as well as some South Pacific, New Zealand and Australasians. A good time to take a break for some food.
12-15	Most of Europe, Eastern Mediterranean and Middle East, west, central and south Africa, northern and central South America with a sprinkling from the Far East.
15-18	All of Africa, all of South America, and a sprinkling of European and Far Eastern.

- 18-21 Most of Africa and a few Europeans, most of the Far East and Asia, all of South America, South Pacific and New Zealand.
- 21-00 South Pacific, New Zealand, Australasia, central and southern South America, and a few Europeans.

¹In some cases a rating of (2) was selected as optimum when no higher rating was expected on a particular path.

The following is a typical *multi-band* operational work plan devised from the propagation charts for an Eastern USA QTH. The plan shows the times and bands when propagation conditions are expected to be optimum to various areas of the world, for each two hour period throughout the day.

Sample Multi-Band Work Plan Eastern USA QTH

(EST) Time	Optimum Band	Areas To Which Band Expected To Be Open
00-02	40	Most of Europe, Eastern Mediterranean and Middle East, most of South America and a few Africans and possibly Antarctica.
02-04	20	Not very much on any band. Some South Pacific, New Zealand and Australasia, a few Far East and Asians, some southern South American and possibly Antarctica. A good time to catch some sleep.
04-06	40	South Pacific, New Zealand, Australasia, some north and central South Americans, a few Far Eastern and Asians, and a possible Antarctica.
06-08	20	Most of Europe, South Pacific, New Zealand, Australasia, most of South America, Asia, Far East and a few Africans.
08-10	15	All of Europe, Eastern Mediterranean and Middle East, most of South America, a few Asians, South Pacific, New Zealand and Australasia.
10-12	10	Most of Europe, most of Africa, most of South America, a few Asians, New Zealand, South Pacific and Australasia.
12-14	15	Some Europeans, most of Africa, most of South America and a few Australasians.
14-16	15	All of Africa and South America, some South Pacific, New Zealand and Australasians, a few Asians.
16-18	20	Most of Europe, Eastern Mediterranean and the Middle East. All of Africa and South America.
18-20	15	South Pacific, New Zealand and Australasia. Far East and some Asian central and southern South America, Antarctica.
20-22	20	Most of Africa, Far East, South Pacific, Australasia. All of South America, Antarctica, and a few Europeans and Middle East.

- 22-00 20 Far East, South Pacific, New Zealand, Australasia, all of South America, Antarctica, and a few African and Asians.

Radio Storms

The forecasts in this column are based on *normal* propagation conditions expected with a sunspot of 86-88. If actual propagation conditions during the contest periods turn out to be *above normal*, DX openings on 10, 15 and 20 meters are likely to be somewhat better than shown in the *Charts*. On the other hand, if radio storms should develop, with *below normal* or *disturbed* conditions during the contest periods, fewer openings will take place on these bands. During radio storms, propagation conditions on 40, 80 and 160 meters generally also become erratic, with poorer openings during certain type storms and improved openings during other types.

If a radio storm should develop, circuits passing through or near polar regions will probably become weak, fade considerably, or may even black out entirely, depending upon the severity and duration of the storm. During certain storms, while east-west propagation may become poorer, north-south openings may improve.

If a storm should occur during the contest periods, concentrate on working the higher bands and paths from the northeast, north and northwest during the daylight hours, and the lower bands and paths from the east, south and west during the evening and early morning hours. A "Last Minute Forecast" for the Phone section of the contest, made at press time, appears at the beginning of this column. A similar forecast for the c.w. section will appear in next month's column.

For a more complete discussion of radio storms, and what can or cannot be done about them on the amateur bands, see "Don't Be Afraid Of The Big Bad Blackout," by John J. Schultz in the November, 1969 issue of *CQ* (page 31).

WWV Forecasts

Propagation data can be obtained during the contest periods from the transmissions of radio station WWV. This station broadcasts general propagation information on 2.5, 5, 10, 15, 20 and 25 mc twelve times every hour. The data is transmitted at 4½ minutes past the hour, and is repeated every five minutes thereafter. The transmissions are updated and revised every six hours.

Given in slow Morse Code, WWV propagation transmissions consist of a letter (N, U or W), followed by a number between 1 and 9. The letter designates propagation conditions expected during the *present* six hour forecast period, as follows:

N—Normal propagation conditions

U—Conditions unstable or erratic, signals sub-

ject to increased fading and noise
W—Radio storm in progress, conditions below normal or disturbed

The number designates propagation conditions expected for the following six hour forecast period, as follows:

1—Useless; 2—Very Poor; 4—Poor-to-Fair; 5—Fair; 6—Fair-to-Good; 7—Good; 8—Very Good; 9—Excellent.

If, for example, propagation conditions are normal during the present six hour forecast, and are expected to be good during the next six hour period, WWV would transmit N 7 in slow Morse Code (— · — · — ·). While forecasts apply primarily to h.f. trans-Atlantic circuits, they are also a good indication of general conditions on a world-wide basis.

V.H.F. Ionospheric Openings

While the CQ DX contest does not include the v.h.f. bands, some ionospheric activity may be possible on these bands during October. There is a fairly good possibility for some 6 meter DX openings between the southern half of the United States and central and southern areas of South America, as a result of trans-equatorial or TE propagation. These openings generally occur during the evening hours, peaking between 8 and 11 P.M. local time, and the path must cross the magnetic equator at an approximate right angle.

Some meteor-scatter openings are likely to occur on the v.h.f. bands during the two-day Orionids meteor shower, which should peak during the late evening hours of October 20 and the early morning hours of the 21st.

Auroral activity is generally on the upswing during October and some auroral-scatter type v.h.f. openings are expected during the month, especially during periods when h.f. propagation is either below normal or disturbed. Check the "Last Minute Forecast" appearing at the beginning of this column for the days that are expected to be in these categories during October.

Post Mortem

CQ DX contests generate a very large amount of radio amateur operating activity throughout the world. For this reason, these contests offer an excellent opportunity to check the accuracy (or inaccuracy) of the CQ propagation predictions. Reports received from previous contests have contributed considerably in improving these forecasts over the years. Any comments or observations concerning this year's contest forecast would be appreciated. Comments of this nature may be sent directly to W3ASK, the Editor of this column.

C.W. Contest Forecast

This month's forecast is valid for both the Phone and C.W. sections of the 1970 Contest. Be sure to keep the Charts appearing in this

month's column for use during next month's c.w. section. Next month's column will contain Short-Skip Charts for November and December, 1970. Short-Skip propagation forecasts for October appeared in last month's column.

Good luck in the Contest! W3ASK

October 15-December 15, 1970

Time Zone: EST (24-Hour Time)

EASTERN USA TO:

	10 Meters	15 Meters	20 Meters	40/80 Meters
Western & Central Europe & North Africa	07-08 (1) 08-09 (2) 09-11 (4) 11-13 (2) 13-14 (1)	06-07 (1) 07-08 (2) 08-09 (3) 09-12 (4) 12-14 (2) 14-15 (1)	06-07 (3) 07-09 (4) 09-10 (3) 10-12 (2) 12-13 (3) 13-15 (4) 15-16 (3) 16-21 (2) 21-00 (1) 00-02 (2) 02-04 (1) 04-06 (2)	16-17 (1) 17-18 (2) 18-20 (3) 20-01 (4) 01-02 (3) 02-03 (2) 03-04 (1) 19-21 (1)* 21-23 (2)* 23-01 (3)* 01-02 (2)* 02-03 (1)*
Northern Europe & European USSR	07-08 (1) 08-10 (2) 10-12 (1)	07-08 (1) 08-11 (3) 11-12 (2) 12-13 (1)	03-06 (1) 06-07 (2) 07-09 (3) 09-11 (2) 11-13 (3) 13-14 (2) 14-20 (1) 20-22 (2) 22-00 (1)	17-19 (1) 19-02 (2) 02-04 (1) 20-03 (1)*
Eastern Mediterranean & Middle East	07-08 (1) 08-10 (2) 10-11 (1)	07-08 (1) 08-09 (2) 09-10 (3) 10-11 (4) 11-12 (3) 12-13 (2) 13-14 (1)	06-10 (1) 10-13 (2) 13-14 (3) 14-16 (4) 16-19 (3) 19-21 (2) 21-23 (1) 23-01 (2) 01-03 (1)	18-20 (1) 20-22 (2) 22-00 (3) 00-01 (2) 01-02 (1) 20-00 (1)*
West & Central Africa	07-10 (1) 10-12 (2) 12-14 (4) 14-15 (3) 15-16 (2) 16-17 (1)	07-10 (1) 10-12 (2) 12-13 (3) 13-16 (4) 16-17 (3) 17-18 (2) 18-19 (1)	04-05 (1) 05-07 (2) 07-13 (1) 13-15 (2) 15-16 (3) 16-18 (4) 18-22 (3) 22-00 (2) 00-02 (1)	18-22 (1) 22-01 (2) 01-03 (1) 00-03 (1)*
East Africa	08-09 (1) 09-11 (2) 11-13 (3) 13-15 (2) 15-16 (1)	07-11 (1) 11-13 (2) 13-14 (3) 14-16 (4) 16-17 (3) 17-18 (2) 18-19 (1)	07-14 (1) 14-16 (2) 16-17 (3) 17-18 (4) 18-21 (3) 21-01 (2) 01-03 (1)	19-22 (1) 22-00 (2) 00-01 (1) 22-00 (1)*
South Africa	08-09 (1) 09-10 (2) 10-12 (4) 12-13 (3) 13-14 (2) 14-15 (1)	07-10 (1) 10-12 (2) 12-13 (3) 13-15 (4) 15-16 (3) 16-17 (2) 17-18 (1)	07-13 (1) 13-15 (2) 15-17 (3) 17-19 (4) 19-23 (3) 23-01 (2) 01-02 (1)	18-19 (1) 19-22 (2) 22-23 (1) 19-21 (1)*
Central & South Asia	08-10 (1) 17-19 (1)	07-08 (1) 08-10 (2) 10-11 (1) 17-18 (1) 18-20 (2) 20-21 (1)	06-07 (1) 07-09 (2) 09-12 (1) 18-20 (1) 20-23 (2) 23-02 (1)	18-21 (1) 06-08 (1)

*Predicted times of 80 meter openings. Openings on 160 meters are also likely to occur during those times when 80 meter openings are shown with a forecast rating of (2) or higher.

Southeast Asia	09-10 (1)	09-10 (1)	06-07 (1)	18-20 (1)
	10-12 (2)	10-12 (2)	07-09 (2)	05-07 (1)
	12-13 (1)	12-14 (1)	09-13 (1)	05-07 (1)
	17-20 (1)	14-16 (2)	18-23 (1)	
		16-18 (1)		
		18-20 (2)		
		20-21 (1)		
Far East	08-10 (1)	08-10 (1)	16-18 (1)	04-08 (1)
	17-18 (1)	17-18 (1)	18-21 (2)	05-07 (1)*
	18-19 (2)	18-20 (3)	21-23 (3)	
	19-20 (1)	20-21 (1)	23-04 (2)	
			04-07 (1)	
			07-09 (2)	
			09-12 (1)	
South Pacific & New Zealand	11-13 (1)	07-08 (1)	17-19 (1)	00-03 (1)
	13-15 (2)	08-10 (2)	19-22 (2)	03-05 (3)
	15-17 (1)	10-15 (1)	22-00 (4)	05-07 (2)
	17-19 (2)	15-17 (2)	00-02 (3)	07-09 (1)
	19-20 (1)	17-19 (3)	02-04 (2)	03-04 (1)*
		19-20 (2)	04-06 (1)	04-06 (2)*
		20-21 (1)	06-07 (2)	06-07 (1)*
			07-09 (4)	
			09-11 (2)	
			11-13 (1)	
Australasia	08-09 (1)	08-09 (1)	06-07 (2)	03-05 (1)
	09-11 (2)	10-13 (2)	07-10 (3)	05-07 (2)
	11-12 (1)	13-15 (1)	10-12 (2)	07-08 (1)
	14-16 (1)	15-17 (2)	12-15 (1)	05-07 (1)*
	16-18 (2)	17-19 (3)	15-17 (2)	
	18-19 (1)	19-20 (2)	17-19 (1)	
		20-21 (1)	19-21 (2)	
			21-23 (3)	
			23-03 (2)	
			03-06 (1)	
Northern & Central South America	07-08 (1)	06-07 (1)	07-09 (4)	18-19 (1)
	08-09 (3)	07-08 (2)	09-11 (3)	19-21 (3)
	08-09 (3)	07-08 (2)	09-11 (3)	19-21 (3)
	09-11 (4)	08-10 (4)	11-14 (2)	21-03 (4)
	11-13 (3)	10-14 (3)	14-16 (3)	03-05 (2)
	13-15 (4)	14-16 (4)	16-21 (4)	05-06 (1)
	15-16 (3)	16-18 (3)	21-01 (3)	19-21 (1)*
	16-17 (2)	18-19 (2)	01-03 (2)	21-03 (2)*
	17-18 (1)	19-20 (1)	03-05 (1)	03-05 (1)*
			05-07 (2)	
Brazil, Argentina, Chile & Uruguay	07-08 (1)	06-07 (1)	06-09 (2)	20-23 (1)
	08-13 (2)	07-08 (2)	09-11 (1)	23-04 (2)
	13-15 (3)	08-10 (3)	14-16 (1)	04-06 (1)
	15-17 (4)	10-14 (2)	16-17 (2)	23-04 (1)*
	17-18 (2)	14-17 (3)	17-19 (3)	
	18-19 (1)	17-18 (4)	19-00 (4)	
		18-19 (3)	00-02 (3)	
		19-20 (2)	02-04 (2)	
		20-21 (1)	04-06 (1)	
McMurdo Sound, Antarctica	17-19 (1)	06-09 (1)	16-18 (1)	00-06 (1)
		15-17 (1)	18-21 (2)	
		17-20 (2)	21-02 (3)	
		20-21 (1)	02-04 (2)	
			04-06 (1)	
			06-08 (2)	
			08-09 (1)	

TIME ZONES: CST & MST (24-Hour Time)

CENTRAL USA TO:

	10 Meters	15 Meters	20 Meters	40/80 Meters
Western & Southern Europe & North Africa	07-08 (1)	06-07 (1)	05-06 (1)	17-18 (1)
	08-09 (2)	07-10 (2)	06-08 (3)	18-20 (2)
	09-11 (3)	10-12 (3)	08-12 (2)	20-22 (3)
	11-12 (2)	12-13 (2)	12-15 (3)	22-00 (2)
	12-13 (1)	13-14 (1)	15-19 (2)	00-02 (1)
			19-22 (1)	19-20 (1)*
			00-02 (1)	20-22 (2)*
				22-00 (1)*
Northern & Central Europe & European USSR	08-10 (1)	06-07 (1)	00-02 (1)	18-20 (1)
		07-08 (2)	06-07 (1)	20-23 (2)
		08-10 (3)	07-09 (2)	23-01 (1)
		10-11 (2)	09-11 (3)	20-23 (1)*
		11-12 (1)	11-12 (2)	
			12-14 (1)	
			16-18 (1)	
			18-20 (2)	
			20-22 (1)	

Eastern Mediterranean & Middle East	07-08 (1)	07-08 (1)	06-08 (1)	17-19 (1)
	08-10 (2)	08-09 (2)	08-11 (2)	19-22 (2)
	10-11 (1)	09-10 (3)	11-13 (3)	22-23 (1)
		10-11 (2)	13-15 (2)	20-22 (1)*
		11-12 (1)	15-17 (1)	
			17-19 (2)	
			19-22 (1)	
			22-01 (2)	
			01-03 (1)	
West & Central Africa	07-09 (1)	06-10 (1)	06-12 (1)	17-19 (1)
	09-12 (2)	10-12 (2)	12-14 (2)	19-21 (2)
	12-14 (4)	12-14 (3)	14-16 (3)	21-22 (1)
	14-15 (3)	14-16 (4)	16-19 (4)	19-21 (1)*
	15-16 (2)	16-17 (3)	19-22 (3)	
	16-17 (1)	17-18 (2)	22-01 (2)	
		18-19 (1)	01-04 (1)	
			04-06 (2)	
East Africa	09-10 (1)	08-10 (1)	06-14 (1)	20-00 (1)
	10-12 (2)	10-13 (2)	14-17 (2)	21-23 (1)*
	12-14 (3)	13-16 (3)	17-20 (3)	
	14-16 (2)	16-18 (2)	20-21 (2)	
	16-17 (1)	18-19 (1)	21-22 (1)	
South Africa	07-08 (1)	06-10 (1)	07-13 (1)	18-19 (1)
	08-10 (2)	10-12 (2)	13-15 (2)	19-21 (2)
	10-12 (3)	12-13 (3)	15-17 (3)	21-22 (1)
	12-14 (2)	13-15 (4)	17-19 (4)	19-21 (1)*
	14-15 (1)	15-16 (3)	19-21 (3)	
		16-17 (2)	21-23 (2)	
		17-18 (1)	23-02 (1)	
Central & South Asia	07-10 (1)	07-08 (1)	06-07 (1)	06-08 (1)
	18-20 (1)	08-10 (2)	07-09 (2)	18-20 (1)
		10-11 (1)	09-11 (1)	
		18-19 (1)	17-18 (1)	
		19-21 (2)	18-21 (2)	
		21-22 (1)	21-23 (1)	
Southeast Asia	09-10 (1)	08-09 (1)	06-08 (1)	04-07 (1)
	10-12 (2)	09-12 (2)	08-11 (2)	
	12-13 (1)	12-16 (1)	11-14 (1)	
	15-16 (1)	16-18 (2)	18-19 (1)	
	16-18 (2)	18-20 (1)	19-21 (2)	
	18-19 (1)		21-22 (1)	
Far East	16-17 (1)	08-10 (1)	06-07 (1)	02-03 (1)
	17-19 (2)	15-16 (1)	07-08 (2)	03-06 (2)
	19-20 (1)	16-17 (2)	08-10 (3)	06-09 (1)
		17-19 (3)	10-12 (1)	02-04 (1)*
		19-20 (2)	16-18 (1)	
		20-21 (1)	18-20 (2)	
			20-22 (1)	
South Pacific & New Zealand	11-13 (1)	08-09 (1)	11-17 (1)	23-01 (1)
	13-15 (2)	09-10 (2)	17-18 (2)	01-06 (3)
	15-17 (3)	10-12 (3)	18-20 (3)	06-07 (2)
	17-18 (2)	12-16 (2)	20-23 (4)	07-08 (1)
	18-20 (1)	16-17 (3)	23-02 (3)	00-02 (1)*
		17-19 (4)	02-04 (2)	02-06 (2)*
		19-20 (3)	04-06 (1)	06-07 (1)*
		20-21 (2)	06-07 (2)	
		21-22 (1)	07-09 (4)	
			09-10 (3)	
			10-11 (2)	
Australasia	08-09 (1)	07-08 (1)	07-08 (2)	02-04 (1)
	09-11 (2)	08-09 (2)	08-10 (3)	04-07 (2)
	11-15 (1)	09-11 (3)	10-12 (2)	07-08 (1)
	15-16 (2)	11-13 (2)	12-14 (1)	03-04 (1)*
	16-18 (3)	13-15 (1)	21-23 (1)	04-06 (2)*
	18-19 (2)	15-16 (2)	23-02 (2)	06-07 (1)*
	19-20 (1)	16-18 (3)	02-04 (3)	
		18-19 (2)	04-05 (2)	
		19-20 (1)	05-07 (1)	
Northern & Central South America	06-07 (1)	05-06 (1)	06-07 (2)	18-19 (1)
	07-08 (2)	06-07 (2)	07-09 (4)	19-21 (2)
	08-10 (3)	07-14 (3)	09-11 (3)	21-02 (3)
	10-15 (4)	14-16 (4)	11-13 (2)	02-04 (1)
	15-16 (3)	16-18 (3)	13-15 (3)	04-05 (2)
	16-17 (2)	18-19 (2)	15-19 (4)	05-06 (1)
	17-18 (1)	19-20 (1)	19-23 (3)	19-21 (1)*
			23-02 (2)	21-02 (2)*
			02-06 (1)	02-05 (1)*
Brazil, Argentina, Chile & Uruguay	06-08 (1)	06-07 (1)	02-06 (1)	19-21 (1)
	08-12 (2)	07-09 (2)	06-08 (2)	21-01 (2)
	12-14 (3)	09-12 (1)	08-14 (1)	01-03 (1)
	14-16 (4)	12-14 (2)	14-16 (2)	03-04 (2)
	16-17 (3)	14-15 (3)	16-17 (3)	04-05 (1)
	17-18 (2)	15-19 (4)	17-22 (4)	21-04 (1)*
	18-19 (1)	19-20 (3)	22-00 (3)	
		20-22 (2)	00-02 (2)	
		22-23 (1)		

COMPLETE RULES FOR 1970 CQ WW DX CONTEST ON PAGE 33

McMurdo Sound, Antarctica	07-09 (1)	07-10 (1)	06-08 (2)	23-05 (1)
	16-19 (1)	15-17 (1)	08-10 (1)	
		17-19 (2)	16-18 (1)	
		19-20 (1)	18-20 (2)	
			20-02 (3)	
			02-04 (2)	
			04-06 (1)	

TIME ZONE: PST (24-Hour Time)

WESTERN USA TO:

	10 Meters	15 Meters	20 Meters	40/80 Meters
Western & Southern Europe & North Africa	07-08 (1)	06-07 (1)	05-06 (1)	18-20 (1)
	08-10 (2)	07-09 (2)	06-08 (2)	20-22 (2)
	10-11 (1)	09-11 (3)	08-10 (1)	22-00 (1)
		11-12 (2)	10-12 (2)	19-23 (1)*
		12-13 (1)	12-14 (3)	
			14-16 (2)	
Central & Europe & European USSR	07-09 (1)	06-07 (1)	06-07 (1)	21-00 (1)
		07-09 (2)	07-09 (2)	
		09-11 (1)	09-11 (3)	
			11-12 (2)	
			12-14 (1)	
			14-19 (2)	
Eastern Mediterranean & Middle East	07-10 (1)	07-08 (1)	06-07 (1)	18-22 (1)
		08-10 (2)	07-10 (2)	06-08 (1)
		10-11 (1)	10-14 (1)	
			14-16 (2)	
			16-18 (1)	
			18-20 (2)	
West & Central Africa	07-09 (1)	06-10 (1)	06-10 (1)	18-23 (1)
	09-11 (2)	10-12 (2)	10-14 (2)	
	11-14 (3)	12-14 (3)	14-16 (3)	
	14-16 (2)	14-16 (4)	16-18 (4)	
	16-17 (1)	16-17 (2)	18-20 (3)	
		17-19 (1)	20-22 (2)	
South Africa	08-09 (1)	06-10 (1)	06-12 (1)	18-19 (1)
	09-10 (2)	10-11 (2)	12-14 (2)	19-20 (2)
	10-11 (3)	11-12 (3)	14-16 (3)	20-21 (1)
	11-12 (2)	12-14 (4)	15-17 (4)	06-08 (1)
	12-13 (1)	14-15 (2)	17-20 (3)	18-19 (1)*
		15-17 (1)	20-21 (2)	
East Africa	08-12 (1)	08-12 (1)	08-13 (1)	18-21 (1)
	12-14 (2)	12-16 (2)	13-15 (2)	06-08 (1)
	14-15 (3)	16-17 (3)	15-18 (3)	
	15-16 (2)	17-18 (2)	18-19 (2)	
	16-17 (1)	18-19 (1)	19-20 (1)	
Central & South Asia	17-18 (1)	16-17 (1)	06-07 (1)	04-09 (1)
	18-19 (2)	17-19 (2)	07-09 (2)	17-19 (1)
	19-20 (1)	19-21 (1)	09-11 (1)	
	06-09 (1)	06-09 (1)	16-18 (1)	
			18-20 (2)	
			20-22 (1)	
Southeast Asia	09-11 (1)	08-09 (1)	06-07 (1)	02-03 (1)
	14-15 (1)	09-11 (3)	07-08 (2)	03-05 (2)
	15-16 (2)	11-12 (2)	08-09 (3)	05-08 (1)
	16-17 (3)	12-15 (1)	09-11 (2)	03-05 (1)*
	17-18 (2)	15-18 (2)	11-12 (1)	
	18-19 (1)	18-20 (1)	17-19 (1)	
Far East	13-14 (1)	11-13 (1)	06-07 (1)	23-02 (1)
	14-15 (1)	13-15 (2)	07-08 (2)	02-05 (2)
	15-17 (3)	15-18 (4)	08-10 (4)	05-08 (1)*
	17-18 (2)	18-19 (3)	10-11 (3)	
	18-19 (1)	19-20 (2)	11-14 (2)	
		20-21 (1)	14-16 (1)	

South Pacific & New Zealand	09-10 (1)	07-08 (1)	11-18 (1)	21-22 (1)
	10-13 (2)	08-10 (3)	18-19 (2)	22-05 (3)
	13-15 (3)	10-12 (1)	19-21 (3)	05-07 (2)
	15-17 (4)	12-16 (2)	21-23 (4)	07-08 (1)
	17-18 (3)	16-17 (3)	23-02 (3)	22-00 (1)*
	18-19 (2)	17-19 (4)	02-03 (2)	00-05 (2)*
Australasia	19-20 (1)	19-20 (3)	03-06 (1)	05-06 (1)*
		20-22 (2)	06-07 (2)	
		22-23 (1)	07-09 (4)	
			09-11 (2)	
Northern & Central South	07-08 (1)	07-08 (1)	18-20 (1)	02-03 (1)
	08-10 (2)	08-10 (2)	20-00 (2)	03-04 (2)
	10-13 (1)	10-12 (3)	00-04 (3)	04-06 (3)
	13-14 (2)	12-14 (2)	04-06 (2)	06-08 (1)
	14-15 (3)	14-17 (1)	06-07 (3)	03-04 (1)*
	15-17 (4)	17-19 (2)	07-09 (4)	04-06 (2)*
Brazil, Argentina, Chile & Uruguay	17-18 (2)	19-22 (1)	09-10 (3)	06-07 (1)*
	18-19 (1)		10-12 (2)	
			12-14 (1)	
McMurdo Sound, Antarctica	06-07 (1)	05-06 (1)	07-09 (4)	18-19 (1)
	07-08 (2)	06-08 (2)	09-13 (2)	19-01 (3)
	08-10 (4)	08-10 (3)	13-15 (3)	01-04 (2)
	10-12 (3)	10-13 (2)	15-18 (4)	04-05 (1)
	12-14 (4)	13-14 (3)	18-00 (3)	19-22 (1)*
	14-15 (3)	14-16 (4)	00-01 (2)	22-01 (2)*
McMurdo Sound, Antarctica	15-16 (2)	16-17 (3)	01-03 (1)	01-04 (1)*
	16-17 (1)	17-18 (2)	03-06 (2)	
		18-19 (1)	06-07 (3)	
McMurdo Sound, Antarctica	06-07 (1)	05-06 (1)	12-14 (1)	20-22 (1)
	07-11 (2)	06-09 (2)	14-16 (2)	22-00 (2)
	11-14 (3)	09-13 (1)	16-17 (3)	00-02 (1)
	14-16 (4)	13-14 (2)	17-19 (4)	22-00 (1)*
	16-17 (3)	14-15 (3)	19-23 (3)	
	17-18 (2)	15-17 (4)	23-02 (2)	
McMurdo Sound, Antarctica	18-19 (1)	17-18 (3)	02-04 (1)	
		18-19 (2)	04-07 (2)	
		19-20 (1)		
McMurdo Sound, Antarctica	07-09 (1)	07-08 (1)	16-18 (1)	00-05 (1)
	16-20 (1)	08-10 (2)	18-20 (2)	
		10-15 (1)	20-02 (3)	
		15-17 (2)	02-04 (2)	
		17-19 (3)	04-06 (1)	
		19-20 (2)	06-08 (2)	
McMurdo Sound, Antarctica		20-22 (1)	08-10 (1)	

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VHF TODAY

BY ALLEN KATZ,* K2UYH

ACCURATE frequency measurement has always been of importance to amateurs. On the v.h.f. bands where much of the long range communications is done on a prearranged basis, it takes on a new dimension. When you are skeding a station a 1000 miles away on M.S. or some other form of weak signal propagation, you really cannot afford to be off by 5 kc.

Despite this need for accuracy, it is surprising how many stations do not know where 144 or 432 mc are truly located. Sometimes it seems that most v.h.f. stations just accept the frequency their h.f. receivers read. If their 2 meter converters have a 14 mc i.f., then 14 mc corresponds to 144 mc. Even though they carefully calibrate their receiver with its (built-in) 100 kc Xtal calibrator, they do not consider the possibility that the crystal in their converter could be off frequency. We have seen some commercial 2 meter converters off by almost 100 kc. On the higher bands the situation can even be worse.

Much of the surplus frequency measurement gear available is not much better; besides being expensive it does not have the required accuracy. For example, on 432 mc with a frequency meter having an accuracy of .005% you cannot tell the frequency of a signal to better than ± 20 kc.

There are ways to measure frequency easily and inexpensively. We employ a 1 mc oscillator-harmonic generator combination. By zero beating the oscillator with WWV we can set its frequency (harmonic) to well within 20 cycles of the WWV frequency being listened to. We zero beat our unit against the 15 mc WWV signal because of the 18 mc limit of our BC-348 general coverage re-

ceiver. With a zero beat frequency accuracy of 20 cycles, the oscillator yields a reference signal with an accuracy of better than ± 200 cycles on 144 mc, ± 600 cycles at 432 mc and ± 18 kc at 1296 mc. If a higher frequency WWV signal were used, even better accuracy would be obtained. A 25 mc WWV signal should provide reference signal accuracies of ± 150 cycles, ± 450 cycles and ± 1350 cycles respectively.

Actually when zero beating a signal, you cannot hear audio frequencies much below 60 cycles; however, the point of zero beat can be extrapolated by setting the oscillator's frequency control trimmer midway between the two points where the (low frequency) audio tone drops out. Another method of obtaining a precise zero beat is to place a Vu meter across a receiver's audio output. If the WWV signal is not noisy, the oscillator's frequency can be adjusted to the point where the Vu meter's oscillations die out.

The oscillator-harmonic generator circuit we use is shown in figure 1. It consists of a surplus 1 mc crystal, two 2N918 transistors and a silicon computer diode, all mounted on a small piece of Vector board. We have built several of these oscillators and all have worked the first time. None of the compon-

[Continued on page 82]

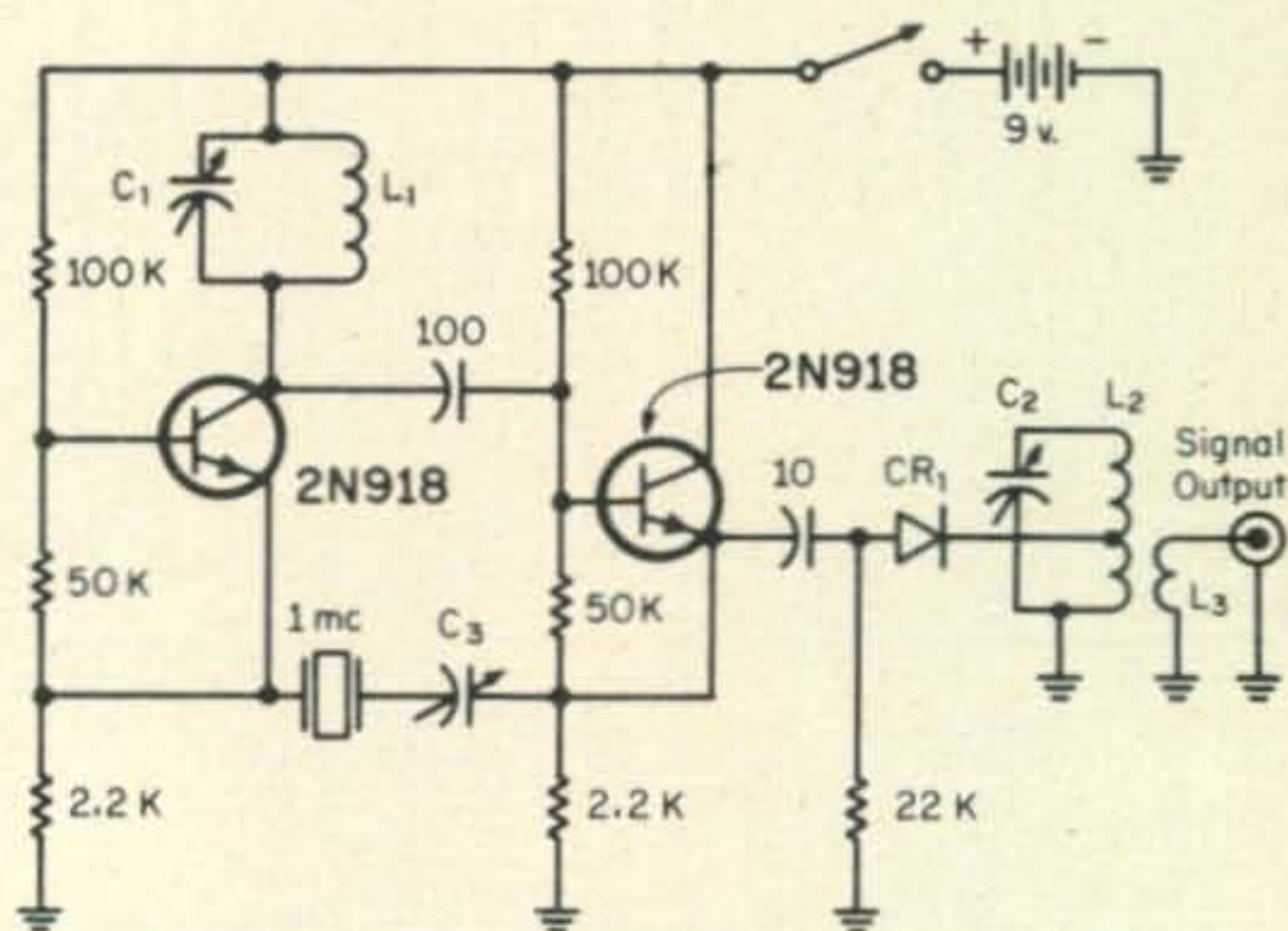


Fig. 1—A 1 mc marker oscillator and harmonic generator.

C₁—300 mmf variable trimmer.

C₂—15 mmf tubular trimmer.

C₃—7-45 mmf ceramic trimmer (osc. freq. control).

CR₁—Silicon computer diode.

L₁—100 uh choke.

L₂—3 ft. #16, 3/8" d.

L₃—1 ft. #, 3/8" d. (pickup loop).

*66 Skytop Road, Cedar Grove, N.J. 07009



THE awards PROGRAM

BY ED HOPPER,* W2GT



THE August, "Story of the Month" about David H. Block, K4AUL, (by Bud himself) after this data.

As you can see in the **Special Honor Roll**, two more qualified for *All Counties*.

A Mixed 300 award went to Juls Pflum, K7ZJP.

Jack Scroggin, W0SJE played possum, then suddenly applied for *All Counties*, endorsed All A3A; 3000, All A3A; as well as 500 through 2500 endorsed All A3A Mobiles.

Willie Carr, WA4RDV also gave me a little work and won a 3000 award endorsed All A3A and 1000 through 2500 endorsed All A3A Mobiles.

Dick Baker, WA0DCQ (from that city with the beautiful name of Minnetonka, Minn.) in addition to his All Counties, also won 3000 and 2500 awards.

Roy Needham, ZL1KG qualified for USA-CA-2500 endorsed All Fone and this is the first 2500 award for anyone outside Canada and U.S.A. Roy puts in a nice signal, long path, on the 14336 Net.

Bob Dyson, K0AYO found time to fill in his *Record Book* and won a 2500 award endorsed Mixed, and 500 through 2000 endorsed All A3A.

Joe Slattery, W9DRL with that big Signal (One) won a 2500 award.

John Kroll, WA8TDY hit me for a USA-CA-2000 award endorsed All A3A and 1000 and 1500 awards endorsed All 14 mc A3A.

Mike Steiniger, K6BEP qualified for 2000, 1500 and 1000 awards. Hope you all know that Mike has taken over publication of the *Independent County Hunter Newsletter*. All the doing on the 14336 Net, so send your \$1.50 for 12 issues (\$2.00 air mail) to Mike

SPECIAL HONOR ROLL ALL 3079 COUNTIES!

- #32—Jack Scroggin, W0SJE 5-28-70.
#33—Richard J. Baker, WA0DCQ 6-8-70
(See Story/Fotos CQ June 1969)

at 11605 Cantlay St., North Hollywood, Calif. 91605. I must admit I do not know the rates for anyone outside U.S. and Canada.

A USA-CA 500 award endorsed All A3A went to Bob Almeida, WA3HBT.

A USA-CA-500 award endorsed All A-1 was issued to Edgar Newman, W2RPZ.

Mixed USA-CA-500 awards were won by: John Farler, K4AVX; Reynold (Mac) McGinnis, WA0RKQ; Harry Jakob, DL8CM; Ivan Pastre, F3AT; Milos Prostecy, OK1-MP; and Doug Bowles, VE4QZ. Sure nice to hear from so many old friends.

While talking about awards, I would like to correct an error that appeared in February CQ, I said the first USA-CA Award to Austria went to Eugene Goffriller, OE3EGL, actually his call is OE2EGL who qualified for USA-CA-500-Award #754, endorsed All A3A.

USA-CA HONOR ROLL.

3000	K6BEP 108	WA4RDV 206
K7ZJP 47	W0SJE 109	K0AYO 207
W0SJE 48	WA4RDV 110	
WA4RDV 49	K0AYO 111	500
WA0DCQ 50		WA3HBT 786
	1500	W2RPZ 787
2500	WA8TDY 138	DL8CM 788
ZL1KG 75	K6BEP 139	K4AVX 789
W0SJE 76	W0SJE 140	OK1MP 790
WA4RDV 77	WA4RDV 141	W0SJE 791
K0AYO 78	K0AYO 142	WA0RKQ 792
W9DRL 79		F3AT 793
WA0DCQ 80	1000	VE4QZ 794
	WA8TDY 203	K0AYO 795
2000	K6BEP 204	
WA8TDY 107	W0SJE 205	

*103 Whittman St., Rochelle Park, N.J. 07662.



"Bud" Bloch, K4AUL

David H. Bloch, K4AUL

Bud writes: "Now that all of the counties have been tucked away, I suddenly find that I really am not happy about the situation. I seem to have too much time on my hands and have actually considered starting all over again. However, I do not believe that the XYL, who incidentally was elected Sweetheart at the Milwaukee Convention last year, could go through another three years of tension. Hence, I will probably return to DX chasing on c.w., though I may yet surprise everyone by tempting the fates at home.

"Enclosed is a picture of me and part of the shack. Actually it is a poor one that makes me look like I weigh about 200 pounds, but it really only proves that I have already reached middle age. (*Perhaps he should have sent a foto of the XYL—Hi-Ed.*)

"I originally became fascinated by amateur radio in 1938 as a youngster in high school. My interest was mainly in the s.w.l. category since I never dreamed that it would be possible for me to attain a license of my own.

"My s.w.l'ing days ceased when I entered and eventually graduated from Queens College in my native New York City. It was there I met Ceal who was to become my XYL in 1945. Now 25 years later, we have three daughters who are enrolled in college themselves.

"Following my graduation in 1942, I entered the air force and remained in service until the end of World War 2. I was dis-



W5DAU Award

charged in 1946 and immediately returned to New York where I was employed by an advertising agency. The rat race in the Big City soon got the best of me, so the entire family packed our belongings and migrated to Richmond, Virginia. Seventeen years later finds me a builder of one family homes and apartment houses and finds the XYL teaching in a local junior high school.

"My interest in ham radio was rekindled in 1958 when I met the late W4OZA, Adolph Marks. Adolph continued to prod me until I finally sat down and started studying for my license. Suffice to say, my first QSO took place on Sept. 28, 1958 as a novice with the call KN4AUL. My first QSO was with who else but W4OZA.

"After getting my ticket, I was enthralled by the c.w. mode of operation. I became a real captive and concentrated on DX chasing. Actually I remained exclusively on c.w. until October of 1967 when I purchased a transceiver. It was then that I suddenly discovered the various nets and, needless to say, I was hooked. My DX chasing came to an abrupt end, and most of my activity was focussed on hunting counties. The net result is obvious: with the help of *MANY, MANY* people, I finally corralled the magic number .. 3079.

"Now that the ultimate (?) in county hunting has been achieved, I must reiterate that the many people: mobiles, net controls, and members of the nets, are the best group of people I have ever met. Many friendships have been made, and I hope that the future will solidify these as well as swell that number. Without their help no one would ever reach that 3079 goal. I just cannot convey enough thanks to this wonderful group of dedicated hams.

"That last contact for San Juan County in Colorado was probably the hardest one I ever got and the complete story would take up more space than my preceding story, suffice to say that when Lee, WAØLIW arrived on frequency, I was actually in my living room talking with my daughter who had just returned from college. A call from Bertha, WA4BMC, got me on the air in exceedingly short order. Band conditions turned bad and I was afraid we would never make it, but the net remained quiet and after *many* tries, I was finally able to copy my report, although Lee got his report on the first try."

Ed: A look at our records show that "Bud"

got USA-CA-500-Award #389, endorsed All A-1 on June 10, 1964. On January 22, 1970 he was issued 1000 #189; 1500 #127; 2000 #92; 2500 #65; 3000 #40; and All 3079 #20, congratulations and hope we see/hear Bud on the Net often.

Awards

Country Cousins Award: As listed in April 1970 CQ, has been abolished as of May 30, 1970.

W5DAU Enchanted Traveler Award: Issued for working W5DAU mobile in at least 30 of New Mexico's beautiful counties. Send data on the QSOs and s.a.s.e. to Jack Shipman, W5DAU, P.O. Box 1443, Hobbs, New Mexico 88240.

Washington State Award: The Puget Sound Council of Amateur Radio Clubs will again issue a Washington State Operating Achievement Award Certificate signed by Governor Daniel J. Evans, for contacts made during Washington State Amateur Radio Week, September 6th through 13th, 1970. Out-of-state amateurs must contact ten Washington hams, and in-state amateurs must contact 20 other Washington hams during this week. Send list of stations worked, their locations, dates of contacts, your name, call, and address to: The Puget Sound Council of Amateur Radio Clubs, 12306 80th Avenue East, Puyallup, Washington 98371.

Utah All-County Award: Now available for 50¢. Any band, mode or emission (except Aeronautical Mobile) may be used, and there is no time limit, just be sure you have all 29 counties. Send GCR list and 50¢ to Custodian: A. David Middleton, W7ZC, Box 303, Springdale, Utah 84767. This award free to handicapped and DX. Award was fotoed on page 111 of October 1968 CQ.

Notes

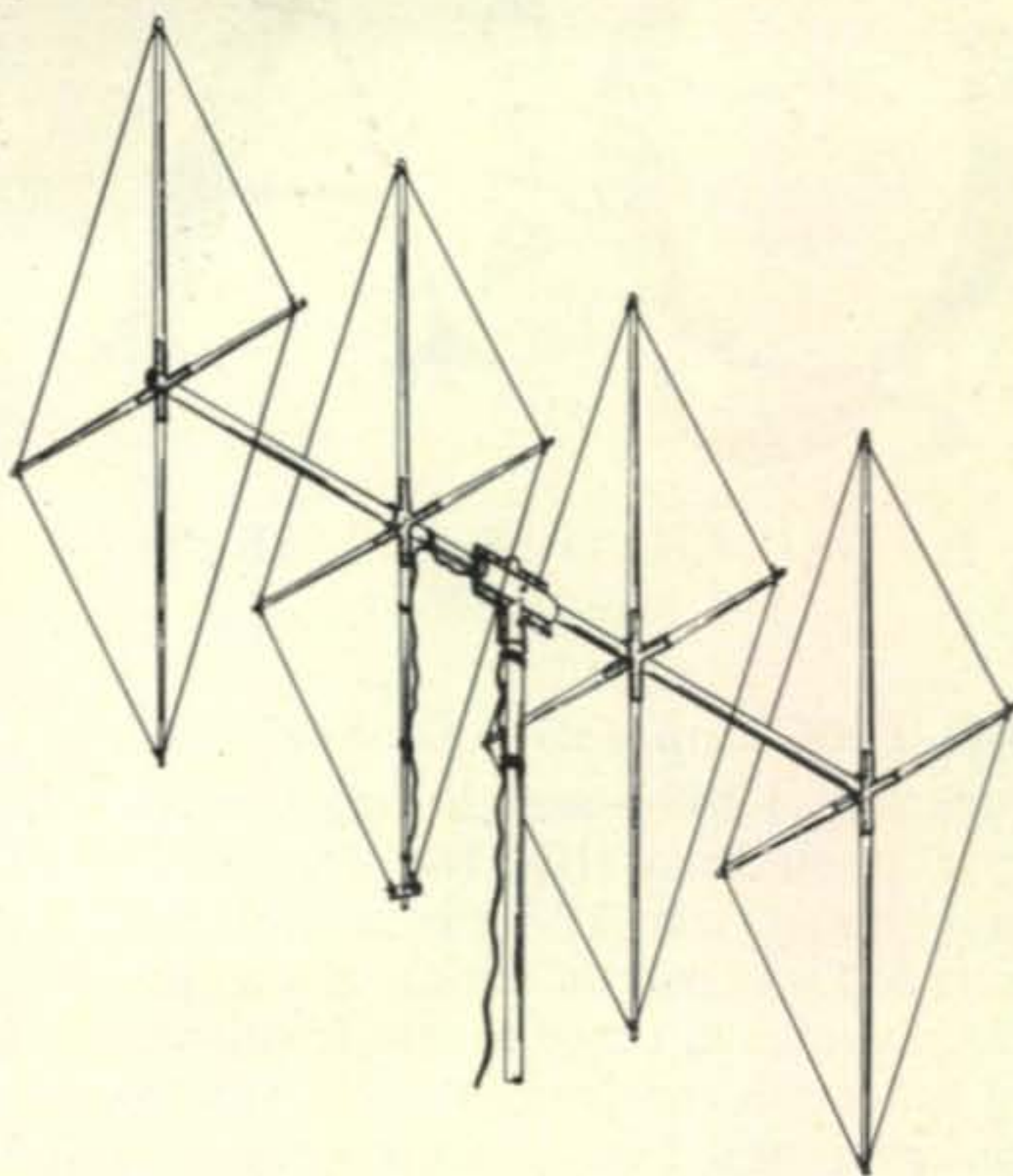
Received a copy of an award issued by the Central Florida Board of Radio Ham Examiners for RUDENESS/HISTRIONICS/EGOTISM which is issued after nomination by two observations of on-the-air performance, but I do not know where to send nominations!

Also received a nice air letter from ex 9V1PD/9V0PD who is trying for USA-CA—he requests QSLs via GM6MD as he is now back in England.

How was your month?, 73, Ed., W2GT.

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2-3-4 ELEMENT TWO-BAND 10-6 METER
2 ELEMENT 40 METER ARRAY
VHF - 4 ELEMENT 6 METER ARRAY
VHF - 4 ELEMENT 2 METER ARRAY

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Q AND A

BY WILFRED M. SCHERER,*
W2AEF

HQ-110C Inoperative On Some Bands

QUESTION: I have been having trouble with my Hammarlund HQ-110C receiver on all bands but 40 and 10. It is possible that the front end was burned out on 21 mc, as I had it turned on and tuned to that frequency during a terrific lightning storm. Any suggestions as to how I might get it working again?

ANSWER: It is doubtful that the malfunction of the HQ-110C is due to its being turned on and tuned to 21 mc during a lightning storm, unless a lightning hit were involved. If so, the most likely damage would be burn-out of one or more coils in the r.f. stage related to the defunct bands. This should be visually indicated by charred insulation or coil windings. Even so, other damage probably would be in evidence if the cause were due to the storm.

A more normal cause of your trouble might be due to failure of the local h.f. oscillator to function on the particular bands. This can be checked by listening for the oscillator signal on another receiver, in which case the oscillator frequency should be found 3035 kc higher than the frequency to which

the HQ-110C is tuned on all bands except 80 and 40, in which case it should be 455 kc higher. On 6 meters it is 3035 kc lower.

Oscillator operation also may be checked by noting if there is any r.f. voltage at grid or cathode of V_{10} (h.f. osc.) as determined with a v.t.v.m. and r.f. probe. A v.o.m. may be used with a 2.5 mk r.f. choke in series with the negative lead of the v.o.m. connected at V_{10} grid. Connect the positive lead to ground. Failure of oscillator operation may be due to weak tube (V_{10}) or dirty bandswitch contacts. The latter may be cleaned with a squirt of "Spray-Kleen."

Dirty contacts also may be involved at the r.f. and mixer coils. The condition of these coils also may be checked with a grid-dip oscillator to find out if they are properly resonating at the desired-band frequency. You might also try connecting an antenna, through a 5-10 mmf coupling capacitor, to the signal grid (pin 7) of V_2 and noting if you then get any signals. If so, the trouble is in the r.f. stage.

In answer to our written reply to the questioner, he reported that the difficulty was traced to the h.f. oscillator.

Switching Crystals in 75S-3

QUESTION: I have been spending long hours at our radio club's MARS station running phone patches from S.E. Asia. It is necessary to change the crystals quite often in our 75S-3C. Anyone who has had to do this knows that it definitely is not easy. Surely, someone has developed a better, more accessible or some way to make this job easier. Do you know of any?

ANSWER: The simplest expedient for facilitating the changing of crystals in the 75S-3 (as recommended by Collins) is to loop a piece of plastic tape or ordinary adhesive tape in between the crystal-holder pins and around the holder in a manner that provides a tab at the top of the holder, allowing the crystal to be easily pulled out (this is the operation that otherwise usually is the difficult part of the job). The crystal frequency or the operating-frequency range may be marked on the tab for ready identification. See fig. 1.

Note that care must be taken to be sure the holder pins are properly aligned with the socket clips when crystals are plugged in. Poor fit or misalignment, requiring excess force, may break the crystal-mounting board.

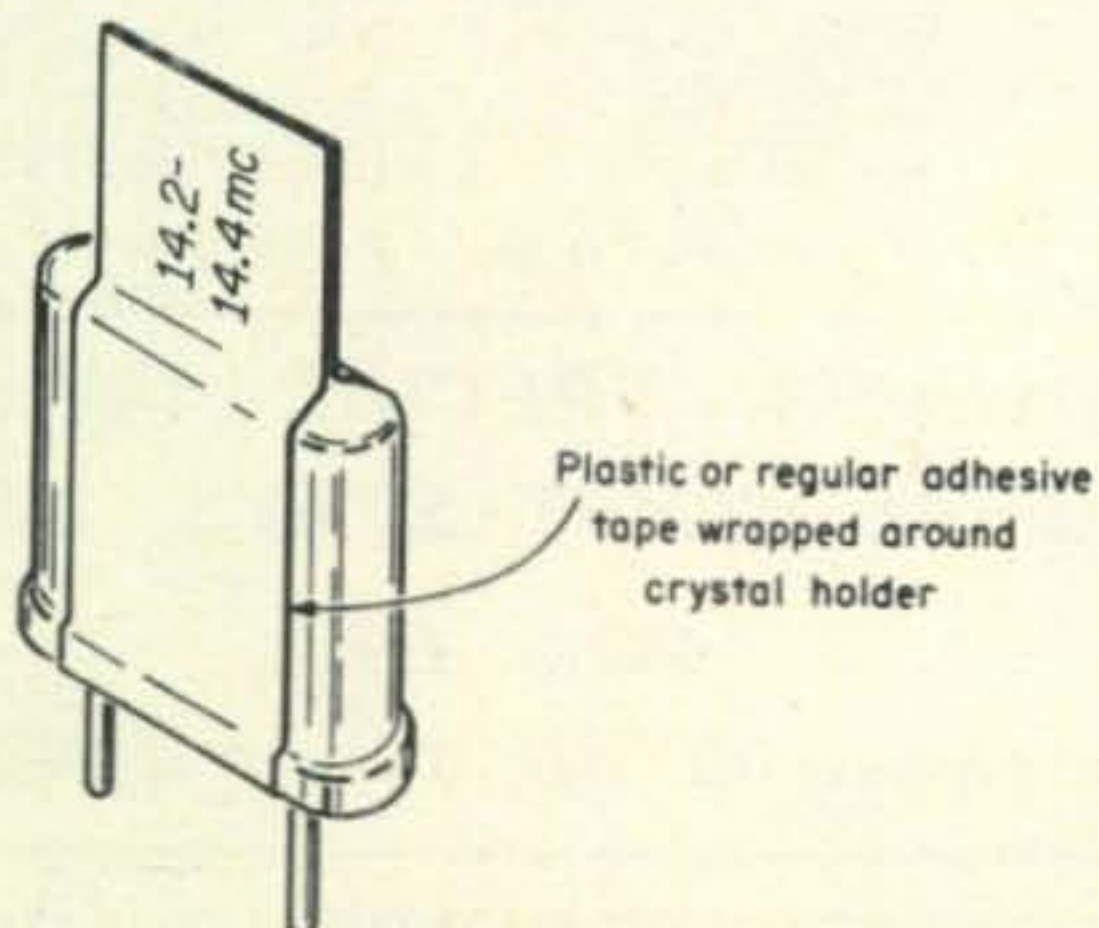


Fig. 1—Method of wrapping tape around crystal holders for facilitating removal of crystals from close quarters.

Isolation Network for Two-Tone Oscillator

QUESTION: I have two a.f. oscillators I'd like to use to furnish a two-tone test signal for s.s.b. testing. How many intermodulation between the oscillators be minimized?

ANSWER: An isolation or combining network for minimizing intermodulation between two a.f. oscillators used to provide a two-tone test signal is shown at fig. 2 for employment with generators with an internal impedance of 100-600 ohms. The isolation obtained thereby will hold the 3rd-order intermodulation to 65-75 db down.

V.F.O. With Drake 2-NT

QUESTION: I should like to find a v.f.o. for my Drake 2-NT c.w. transmitter. Will the Health HG-10B fit the bill? What changes would be needed?

ANSWER: The HG-10B v.f.o. works fine with the 2-NT. You'll have to rig up a separate power supply for the v.f.o. or "steal" some power from the 2-NT. Plate potential of 250 v. may be obtained from the junction of R_{32} - R_{33} . Then alter the 0B2 dropping resistor in the v.f.o. as per manual instructions.

The v.f.o. output may be plugged into either crystal socket in the 2-NT. The ground side of the v.f.o. output goes to the left pin of the crystal socket as viewed from the front. The hot side goes to the right pin.

The v.f.o. must be set up for cathode keying as indicated in the HG-10B manual. The key line from the v.f.o. then plugs into the V.F.O. KEY jack at the left rear of the 2-NT chassis.

P.T.T. With DX-60B

QUESTION: Have you any information on modifications that can be made for push-to-talk operation with the DX-60B?

ANSWER: The DX-60B may be set up for p.t.t. operation by plugging a s.p.s.t. p.t.t. switch into the c.w. key jack; however, this will not control the receiver muting/standby circuits or an antenna relay.

An alternative is to use a d.p.s.t. switch as shown at fig. 3A. The switch may be a push-button type installed on the mic, mounted in a small accessory box or rigged up as a foot-switch. With the DX-60B function switch set for a.m., one half of the switch actuates the transmitter (by removing blocking bias), the other half operates a 6.3 v.a.c. relay that handles the receiver muting and the antenna changeover.

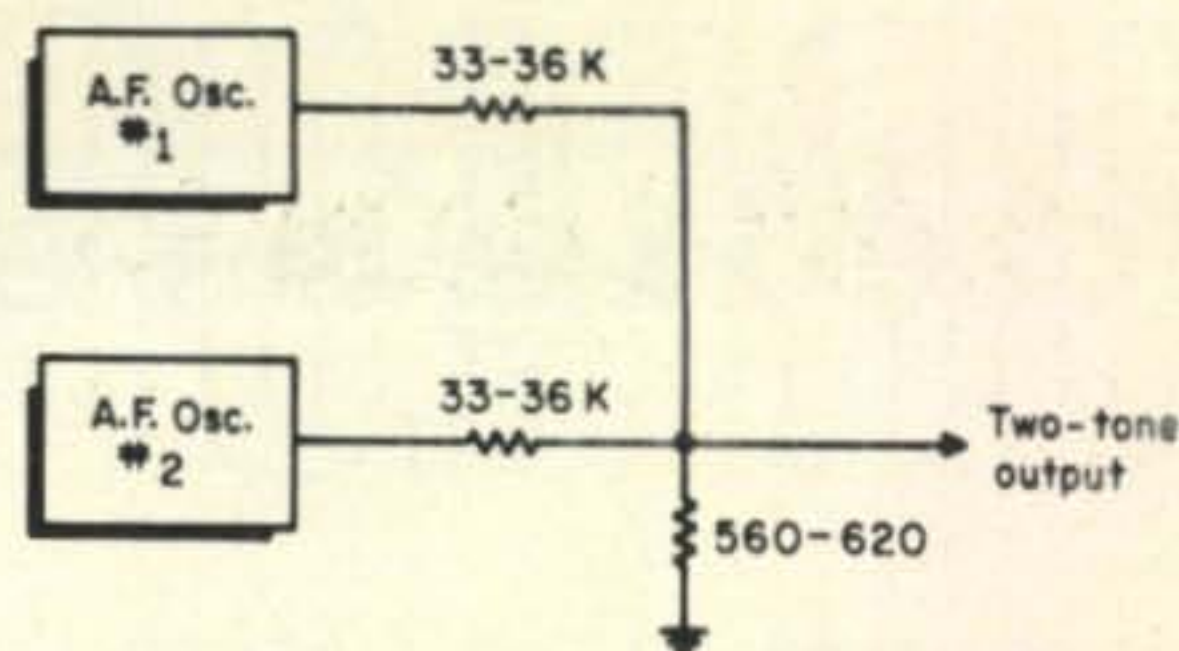


Fig. 2—Isolation/combining network for minimizing inter-modulation between a.f. oscillators used for two-tone testing.

If receiver muting and antenna changeover is presently accomplished using a 117 v.a.c. relay controlled through terminals 5-6 on the DX-60B accessory socket, a d.p.s.t. switch may be used by disconnecting the lead between terminal 5 on the accessory socket and terminal 9 on the function switch; then rigging up the p.t.t. switch and relay as shown at fig. 3B.

[Continued on page 84]

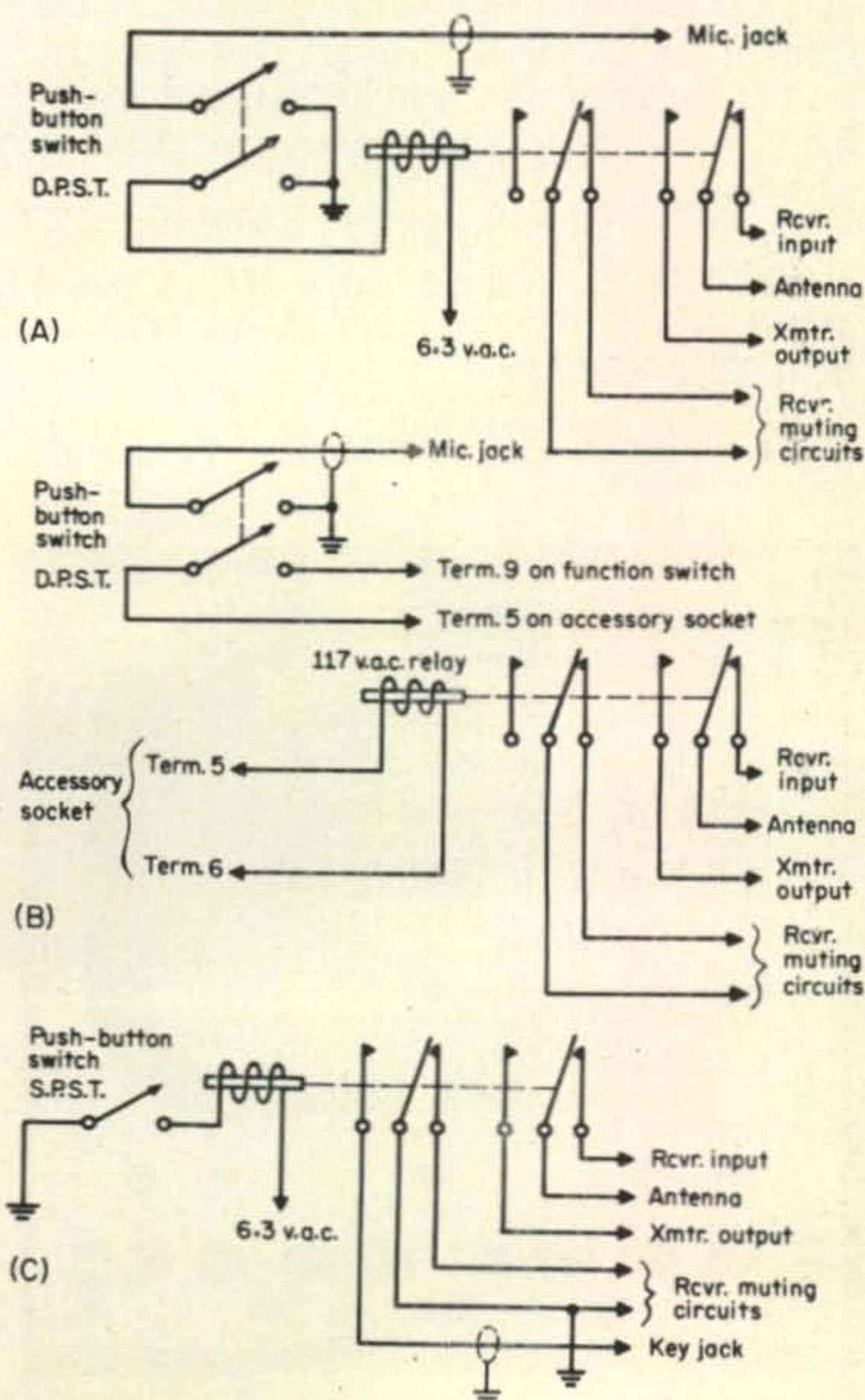


Fig. 3—Circuitry of various methods for obtaining p.t.t. operation with DX-60B as explained in text.

SURPLUS sidelights

BY GORDON ELIOT WHITE*

WHY squint at small 'scopes if you can have a really good-sized screen to look at? Those three-inchers are tiny, and even the usual five-inch size is not big enough to properly impress people who have watched Star-Trek or read the better grade of science fiction. To really give a show to people who drop into the shack to look at all the fancy equipment, why not have a seventeen inch, or better a 21 inch oscilloscope in the rack?

You too can have a 'scope like those used to track the Astronauts through space. Remember the Mission Control consoles of the Gemini era? A lot of them are now obsolete, part of the growing world of National Astronautics and Space Administration (NASA) surplus.

Fig. 1 is a photo of an ITT 17-inch scope, model 1735-D, taken from a NASA panel at the Goddard Spaceflight Center, Greenbelt, Maryland. Similar 'scopes, some built

*5716 N. King's Hwy., Alexandria, Vir. 22303.

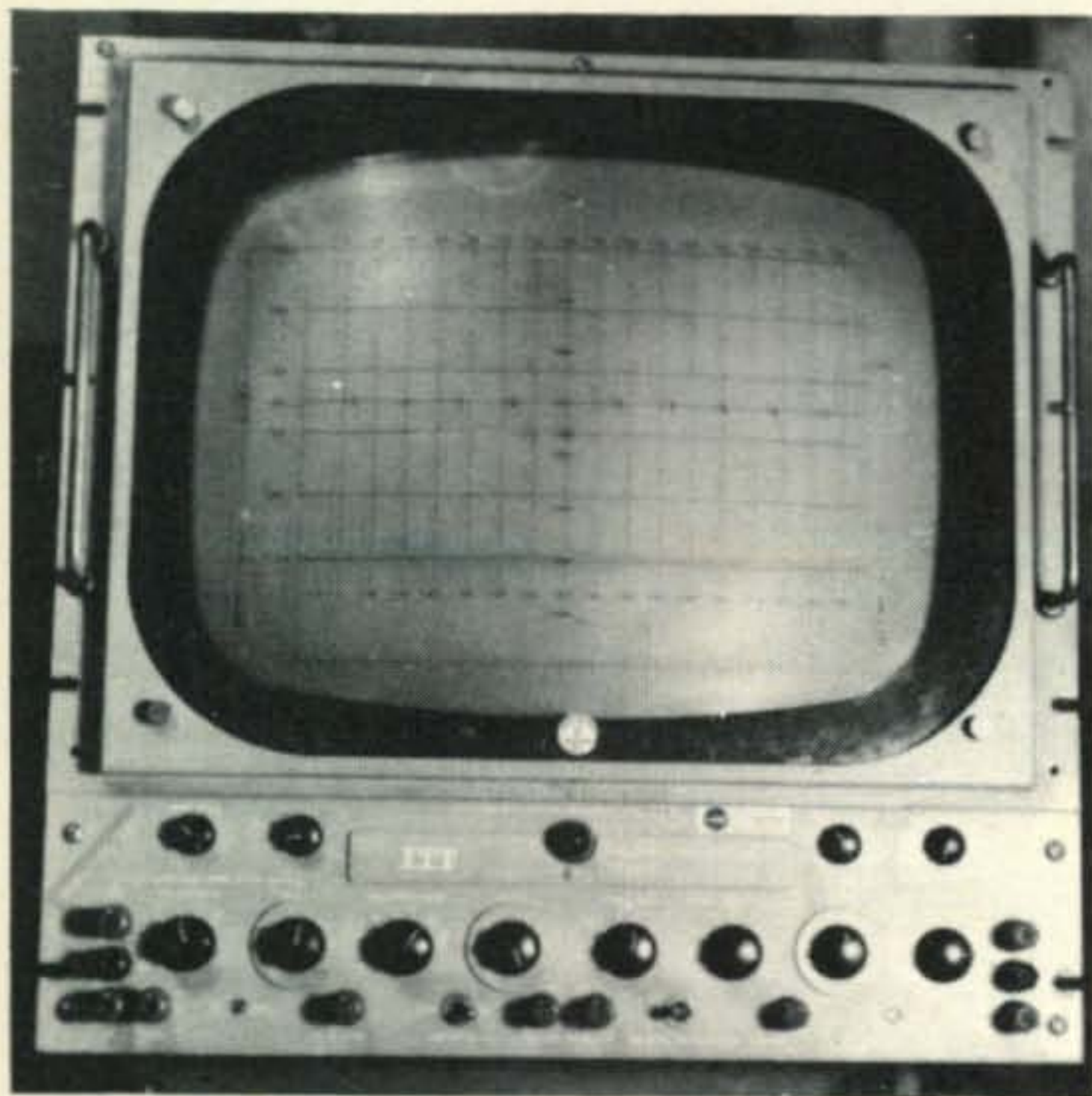


Fig. 1 A NASA large-screen oscilloscope which turned up in surplus in the Washington, D.C. area. This unit requires a separate power supply, which could be home-brewed in a pinch.

by Bendix, have been surplused from Cape Canaveral and other NASA tracking points. Some have been the even bigger 21 inch (2135-D) models which use the same basic circuitry.

The 1735-D is the most common of the NASA surplus large-screen 'scopes, and since this one will fit in the standard 19 inch rack that many amateurs and experimenters use, it is probably the most useful one to describe. Most of the specs for the 1735-D will apply also to the 2135-D.

The unit obviously provides a great deal better resolution than a five-inch oscilloscope which has less than a tenth of the screen area. These big 'scopes are not merely television sets with a few modifications, but they are specially designed to eliminate geometric distortion such as "pin-cushioning" or non-orthogonality, which would otherwise render a screen so large virtually useless for precision work.

Linearity is rated within 1 percent, and measurement accuracy within plus or minus 2 percent of full scale value from d.c. to 18 kc per second (22 kc for the 21 inch screen) on the vertical axis and d.c. to 8.5 kc on the horizontal axis. Higher-frequency presentations, up to 200 kc, can be used with good linearity by restricting the display to the center portion of the screen. The limitation is imposed by the inherent maximum velocity of the spot without distortion.

The 1735-D uses magnetic deflection on a 17QCP7 cathode ray tube, with a 6,000 volt flyback supply. Resolution at the center of the screen is rated at 40 lines per inch.

Sweep ranges provided are continuously variable from 10 microseconds per inch to 1 second per inch, with calibration accuracy rated at six percent or better, triggered or recurrent.

The 1735-D set contains 43 tubes, aside from the CRT. The only special "bottles" are a pair of specially-aged 12AX7's designated EM-1217, and available from ITT Instruments Co.

Both large-screen 'scopes, since they are magnetically-deflected, are extremely sensitive to stray magnetic fields such as are created by electric motors, or Sola constant-voltage transformers, etc. Even the power supply itself should be kept more than a foot from the oscilloscope. Magnetic fields affect the 'scope by increasing the spot size or by impressing 60-cps modulation on the trace. A magnetic shield kit was at one time available from ITT for critical applications.

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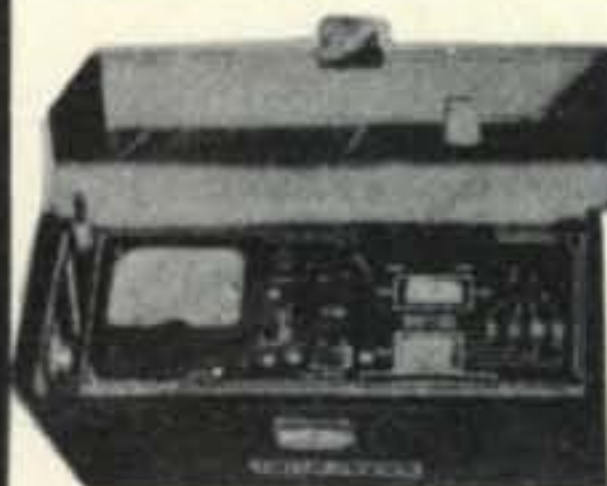
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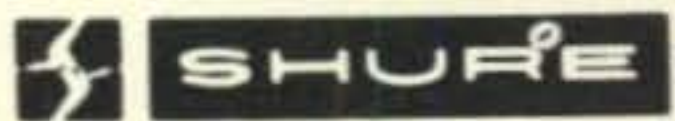
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These big scopes are obviously useful for most amateur purposes, particularly at audio frequencies such as setting RTTY demodulator filters, or for displaying an RTTY + tuning pattern, or for the other common low-frequency applications. They are not going to be much use at high frequencies, but their surplus cost—probably under \$100—does not put them in the same price category as the Tektronix 'scopes used in the high megacycle ranges, either.

Applications include voltage measurements, which can be made quite accurately if the 1735-D is correctly calibrated. Inherent errors are less than five percent, and generally within one percent at moderate deflection angles on the CRT. Parallax, or the viewing of the trace from an angle *not* directly in front of the CRT screen, is the potentially largest error factor. The controls on the 'scope are calibrated in volts per inch, making readings simple, once the trace is set to provide a ten inch reflection on the CRT face.

Frequency measurements may be made by stabilizing one cycle of the unknown a.c. signal and using the following formula:

$$\text{frequency} = \frac{1}{\text{sec/inch} \times 15}$$

Time measurements are made by setting the sweep trace accurately to 7.5 inches, by using the horizontal attenuator, and then doubling it to 15 inches with the $\times 2$ position of the SWEEP MAGNIFIER switch (since the controls are calibrated on a 15 inch basis, "time per inch.")

AFCEA Show

I took a quick look this summer at the Armed Forces Communication and Electronic Association (AFCEA) Show, held in Washington every year—it is usually a good place to see what will be surplus in a year or two. It might surprise people to see how fast some gear moves from "new" to the obsolete category...

My time there was short, but I did drool a bit over one item that unfortunately seems unlikely to escape from military hands soon, the new Collins 651-S1 Communications Receiver. This latest gem from the boys at Collins' Dallas plant is all solid state, with digital readout on six Nixie-type tubes. It may be sacreligious to compare anything with the Collins R-390—a communications receiver, but the 651-S1 looks like a worthy successor.

All solid state, it covers more bands than the R-390 series, from 400 kc to 30 mc in 100 c.p.s. units. (A variable b.f.o. provides interpolation between 100 cycle points).

No band switching is required, but coarse frequency controls do provide for faster tuning than the main knob offers (broken-wrist R-390 owners note).

The master oscillators are tuned by varying a phase-locked synthesizer which offers stability in the order of five parts in 10^7 . Provisions are offered for reception of a.m., s.s.b., RTTY, "narrow band secure voice" and c.w. signals. Syllabic-rate squelch is offered for noise immunity, along with optimum bandwidths for different modes. (s.s.b.: 2.7 kc, c.w.: .5 kc, etc.) Sensitivity ranges from 2 microvolts (s.s.b.) for 10 db signal plus noise to noise below 1.6 to .7 microvolts at 30 mc, s.s.b. mode.

RTTY Notes

One final idea which W2DLT just suggested to me on the land-line:

If you are using a series (governed) a.c. motor on your Teletype printer for RTTY operations, you can add a Triac motor-controller to the power circuit and get a reliable speed control. Not only will you be able to accurately set your equipment to the standard amateur 60 word per minute speed, but within limits, you can set your machine to other standard speeds (66, 67, 75, 100 w.p.m.) without buying a costly gear shift, which is available only for #28 units, at prices running in the vicinity of \$200.

Caution: do not run a #15 at speeds over 100 w.p.m. Only the more finely-built European versions such as the Lorenz machines can take the higher speeds without damage. The #28 series can operate to 107 w.p.m. (printing equipment) or 200 w.p.m. (performing or tape-reading only). ■

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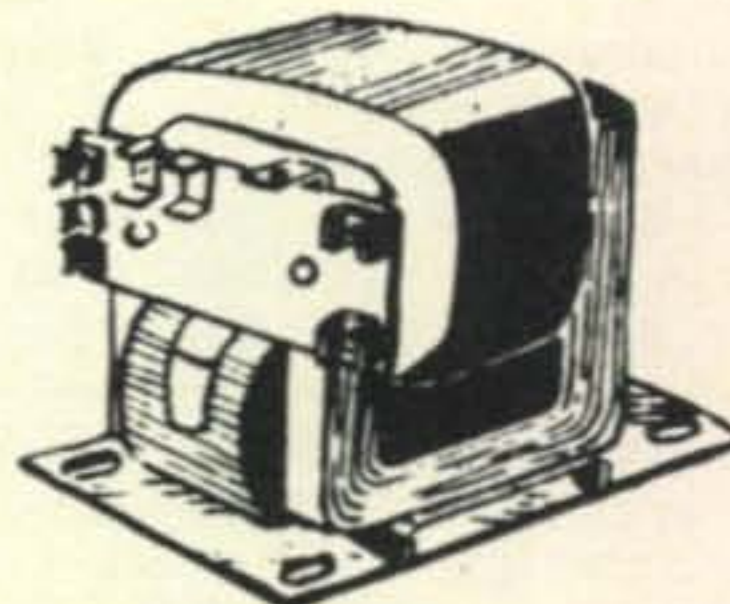
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VHF [from page 72]

ents appear to be critical. First adjust the
 oscillator's L-C tuned circuit for 1 mc with
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 readjust the tuned circuit for oscillation as
 indicated on the G.D.O. or by an upward
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 valuable tool and expect that you will find
 it useful too.

73, Allen Katz, K2UYH

DX [from page 62]

CT1LN—Via WA3HUP.

DL4VA—Hugh Vandegrift, MATCOM-DSO,
 APO New York, N.Y. 09052.

DL4TJ/LX—Via DARC, Box 99, 8 Munich 27,
 Germany.

DL4WJ/LX—To DARC.

F0WJ/FC—c/o W5QNY.

F0WV & F0WV/FC—Via ON4TJ.

FC0UG—Hugh Vandegrift, MATCOM-DSO,
 APO New York, N.Y. 09052.

FH0VP—To W2MZV.

FM7WN—c/o K2KGB, P.O. Box 73, Coram,
 N.Y. 11727.

GD3TXF—Via G3TXF, Holt Cottage, Kingston
 Hill, Surrey, England.

GUS—All stops on present DXpedition to
 W2MZV, Box 102, Yonkers, N.Y. 10702.

HS5ABD—c/o W6DQX.

HT4CI—Via WB9BUV, 4218 N. College St.,
 Indianapolis, In. 46205.

HT4IM—To W5QPX.

KA1B—c/o WA8NZH.

KA2AA—Via WN4QDR, 131 Lakeview Drive,
 Asheboro, N.C. 27203.

KG4AS—To W2AS.

M1B—Via WA3 HVP,
 not WA2HUP. (Tmx
 W2DTK).

TG9MD—Via WB4LK
TR8AG—c/o CR6GO,
 Box 10408, Luanda,
 Angola.

TT8AN—Via W5LEF.

VK9TG—To W2CTN.

VK9XI—c/o W2-
 GHK.

VK0KJ—Via K4HJE.

VP1VR—To W4VPD.

VP2AA—c/o VE3-
 ACD.

VP2KF—Via VE3-
 DLC.

VP8KE—To W4NJF.

WA2ZEZ/mFM7 &/
mKV4—c/o WA2-
 ZEZ.

WB6NWW/4X—Via
 WB6NWW.

XW8AX—To W6-
 KTE.

XW8BP—c/o K6-
 HPZ.

YA1DAN—Via KP4-
 CL.

YA1R—To G3TXF,
 Holt Cottage, Kings-
 ton Hill, Surrey, Eng-
 land.

YA2HWI—c/o W9-
 FLJ.

YA5PG—Via DL6ME.

ZC4GM—To W2CTN.

ZD5R—c/o VE4OX.

ZD8BE—Via W2-
 GHK.

ZD8BL—To WA6-
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ZD8Z—c/o W6CUF.



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Passband Ripple	< 1 dB	< 2 dB	< 2 dB	< 2 dB	< 2 dB	< 1 dB
Insertion Loss	< 3 dB	< 3.5 dB	< 3.5 dB	< 3.5 dB	< 3 dB	< 5 dB
Input-Output Z_t	500 Ω	500 Ω	500 Ω	500 Ω	1200 Ω	500 Ω
Termination C_t	30 pF	30 pF	30 pF	30 pF	30 pF	30 pF
Shape Factor	(6:50 dB) 1.7	(6:60 dB) 1.8 (6:80 dB) 2.2	(6:60 dB) 1.8 (6:80 dB) 2.2	(6:60 dB) 1.8 (6:80 dB) 2.2	(6:60 dB) 1.8 (6:80 dB) 2.2	(6:40 dB) 2.5 (6:60 dB) 4.4
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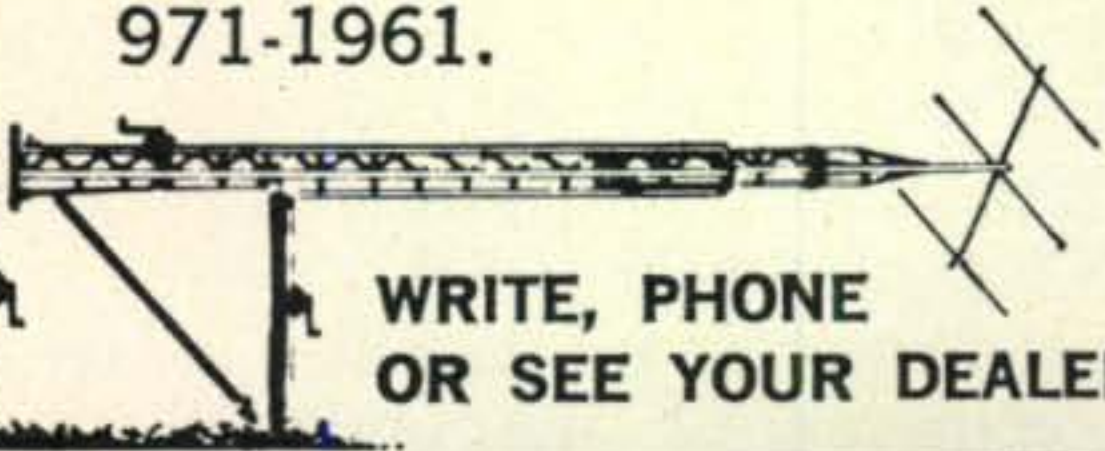


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73, John, K4IIF

CQ & MS Generator [from page 48]

Generally, complex units have been made on two boards measuring some 10" x 5". The ICs conveniently fit on 0.1" pitch Vero-board so that the oscillator, decades and programmer were put on one board while the decoders and code selection diodes were put on specially made double sided boards. Vero-board could be used here again by placing two boards back to back with the copper lines at right angles. Diodes can then be positioned one side with one lead soldered the same side as the diode and the other passing through the boards to the other side. To prevent a short circuit between the unwanted copper and the diode lead a small drill can be used to remove the copper so that clearance is provided.

The power supply is generally kept separate as it requires a heat sink for the series transistor and the resulting temperature rise is better kept away from the other components.

The photographs show the Complex CQ generator and the revised MS data generator with its plugs and sockets for call sign build up.

During development no ill effects were noticed due to poor layout and it would appear that the constructor has considerable latitude in the method of construction. ■

Q&A [from page 77]

A third setup that requires a s.p.s.t. switch is shown at fig. 3C. In this case the normal p.t.t. switch on the mic may be used. Instead of being plugged into the key jack, the hot lead from the mic p.t.t. switch may be wired to the top of the key jack through a two-terminal connector for the mic. One terminal of the connector is used for the mic circuit, the other for the p.t.t.-switch circuit. During operation, a dead or open-circuit phone plug should be inserted into the key jack. This will lift the ground off the keying line and allow the p.t.t. switch to take over control.

73, Bill, W2AEF



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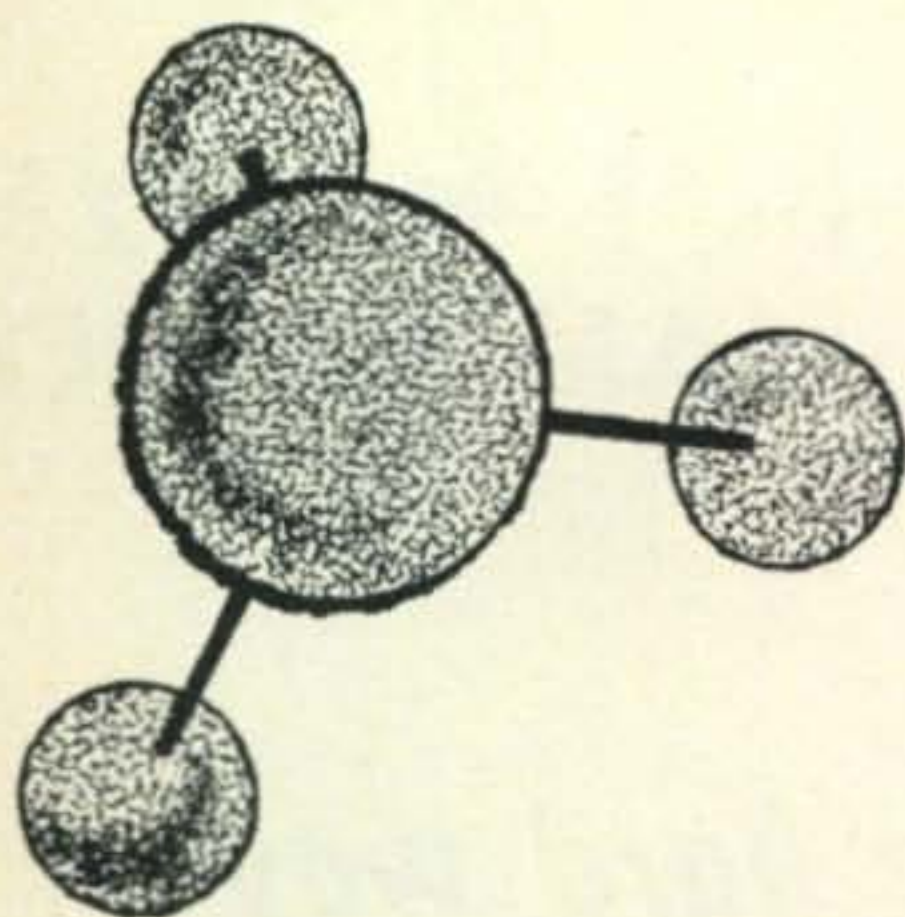
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Midscale resistance range is 60 ohms so the wide 2 $\frac{1}{4}$ " scale permits accurate measurement all the way up to 12 megohms. Dimensionally the illustration is about full scale 5 $\frac{5}{8}$ " x 3 $\frac{5}{8}$ " x 1 $\frac{3}{4}$ " thick inclusive of rubber feet. Exquisitely crafted

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Solid State v.f.o. [from page 21]

from 6.7 to 8.6 v. produced *absolutely* no beat change when zero beating as above.

3. S.s.b. signals in the 20 m. band were easily tuned and tracked during a variety of listening sessions.

Frequency reading is correct to ± 0.5 kc over the range reported. Reading accuracy is primarily a consequence of the builder's patience in performing countless checks and improvements, rather than giving up after a few trials. It should further be added that with a permeability tuned system it is relatively easy to achieve good linearity over a 200 kc range or so, but difficulties increase rapidly when one attempts wider bandwidths. In my particular case (600 kc bandwidth) trouble develops at the high end of the band and frequency deviation is about 2 kc from 5,600 to 5,700 kc, jumping to 7 kc from 5,700 to 5,800 kHz. No serious attempts were made to linearize the unit in this range, as it was not of interest.

Equivalent dial length is about 16.5 ft. per mc, this being one of the most remarkable characteristics of digital read-out using counters, mainly in function of their overall size.

Total cost to build a similar unit is anywhere between \$10 and \$20, depending on supply of parts. The GE gear set was preferred because of its robust construction, but on the surplus market there are plenty of parallel gears available with the proper diameter ratio (1:5 or thereabout).

Conclusion

A permeability tuned v.f.o. can be home-built achieving results competitive with commercial gear; sizewise it can be made smaller than similar gear tuned conventionally with a variable capacitor, moved by a worm gear or by a train of parallel gears. A permeability tuned v.f.o. tends to be, in my opinion, easier to assemble and run, from a mechanical standpoint, than a comparable capacitor tuned unit. Its adjustment and achievement of similar linearity, however, may be quite delicate and time consuming; much retouching of the original wiring may lead to having the equipment losing some of its original "freshness" that characterizes new equipment.

My thanks go to Maiso, PY2GP for helping designing the circuit and allowing use of his workshop. ■

Resistor-Rite [from page 49]

For values of 100 ohms or less, the RANGE switch is turned to the LO position to eliminate residual resistances usually encountered in the higher range pots. This is a pretty simple but very useful gadget, and, incidentally, much less costly than the price of 5 switches and a handful of 1% fixed resistors!

Audio Oscillator [from page 50]

capacitance can be calculated from the basic equation:

$$f = \frac{1}{2\pi\sqrt{RC}}$$

This frequency is the point where the R-C network introduces a 180 degree phase shift. Using a nominal R of 10K, the basic equation can be simplified to:

$$C = \frac{6.5 \times 10^{-6}}{f}$$

where C is the capacitance in mf required to produce a 180 degree phase shift at frequency f in mc.

A Motorola dual chip NPN transistor type MD-1122 was used for the Darlington pair—mainly because it was available cheap on the local surplus market. Two 2N440's could have been used just as well, or, for that matter, practically any audio NPN with a beta of around 60.

If a transistor other than the MD 1122 is used, the 680K and 110K resistors forming the divider pair will have to be changed. Select values that provide a 6 to 7 volt drop across the 600 ohm emitter resistor.

After completing and checking the wiring, operation is verified by hooking a pair of headphones across the output terminals and switching the oscillator through the four positions. For best performance, the frequencies should be accurately set using a counter, or by Lisajou scope pattern comparison with standard tones. ■

CQ Reviews: Collins 30L-1 [from page 27]

Operation and Performance

The following results were obtained with the 30L-1 while using a 32S-3 for the exciter and a line potential of 230 v. under load.

After initial tuneup with 50-watts drive (approx. 150 ma p.a. current on the 32S-3) and in accordance with the tune-meter indication, the application of 70 watts of carrier from the exciter resulted in an amplifier d.c. input of 1150 watts and an r.f. output

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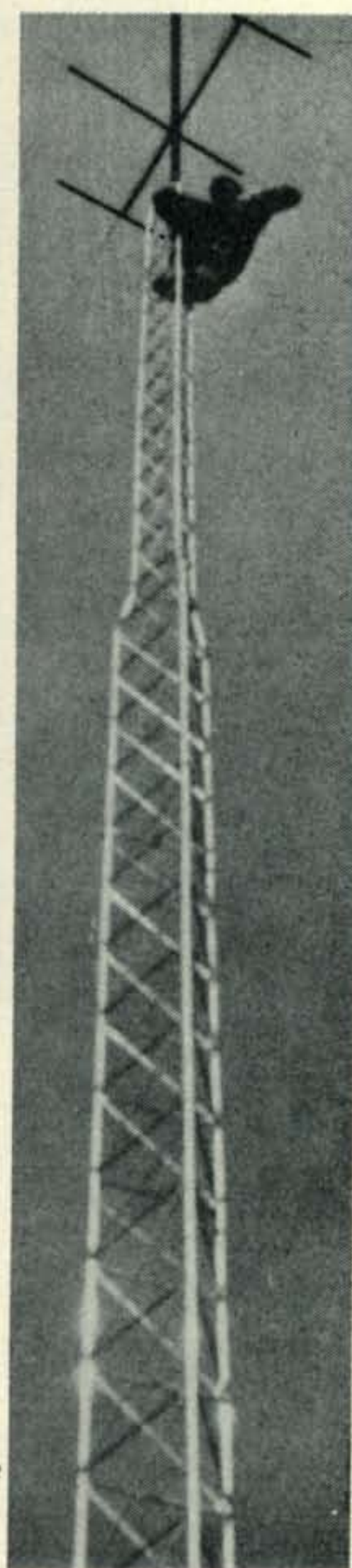
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of 600 watts. With maximum carrier from the exciter (110 watts) the amplifier input was 1300 watts and the r.f. output 800 watts.

Operation with voice modulation on s.s.b. and with maximum peak output from the exciter (6 db of a.l.c. from exciter only), the amplifier peak power was about 20-percent higher or close to 1600 watts peak input and 950 watts peak output.

With the maximum available peak drive from the exciter during a two-tone test, *no* a.l.c. from the amplifier and with a peak input to the amplifier of 1350 watts, the 3rd-order distortion products observed on a spectrum analyzer were 34 db below peak output (the manufacturer's rating is 30 db down at 1000 watts peak input).

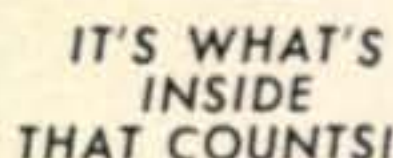
Good linearity was still indicated by a trapezoid display on an oscilloscope during voice operation up to 1600 watts peak input⁴. Although such operation exceeds the manufacturer's ratings for the amplifier, no adverse effects on the tubes or other components were experienced during months of operation at the higher-power levels.

During this time, however, it was found advisable to occasionally check the adjustment of the bridge-balance control for the tunemeter setup (adjustment details are given in the manual). Any off balance here will provide a false indication of proper loading, with the end result of causing the tubes to run hot, give low output or inferior linearity.

Use of the tune-meter during adjustment for c.w. operation resulted in only 400 watts output when the amplifier was driven to the legal 1000-watt input. On the other hand, with 70-100 watts drive applied, disregarding the tunemeter and loading for a total input of 1000 watts, resulted in 650 watts output for c.w.

In spite of its ten-year-old design, the 30L-1 still can hold its head high in the face of more recent productions. Furthermore, it is doubtful that any significant advantage could be gained by going to a 2000-watt p.e.p.-input job for s.s.b., since the power gain between such and the capabilities of the 30L-1 amounts to a ratio of only 1.25-1.5 db ($\frac{1}{4}$ S-unit). In addition, all test results were essentially the same on every band, indicating that the 30L-1 can maintain a clean-quality signal and uniform performance regardless of the operating frequency.

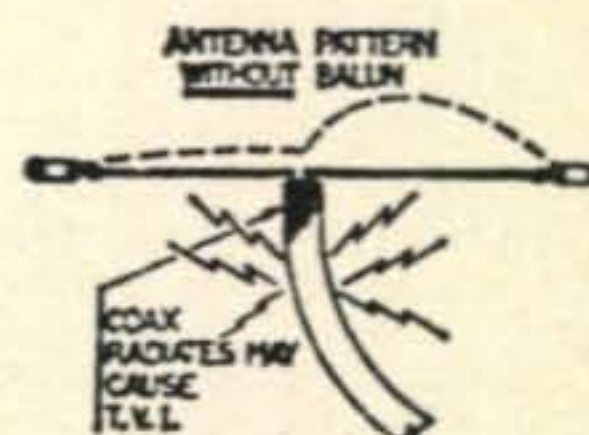
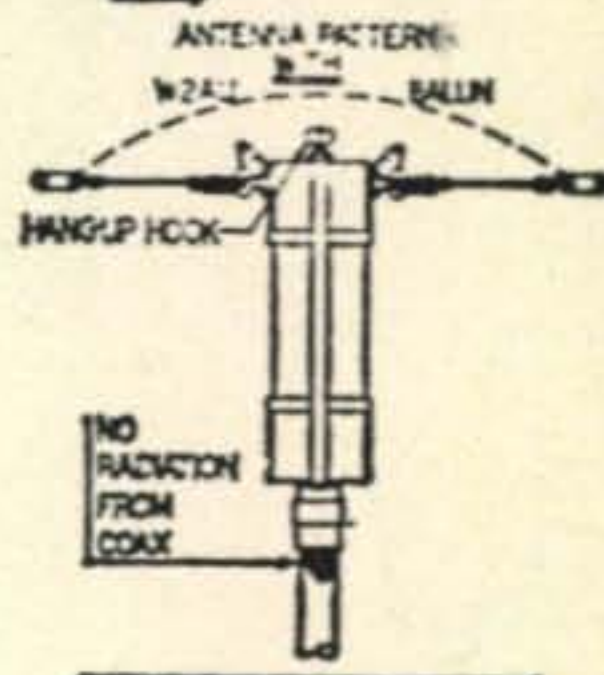
⁴Note that a.l.c. from the amplifier was not required to keep the amplifier itself from being overdriven in any of the foregoing tests.



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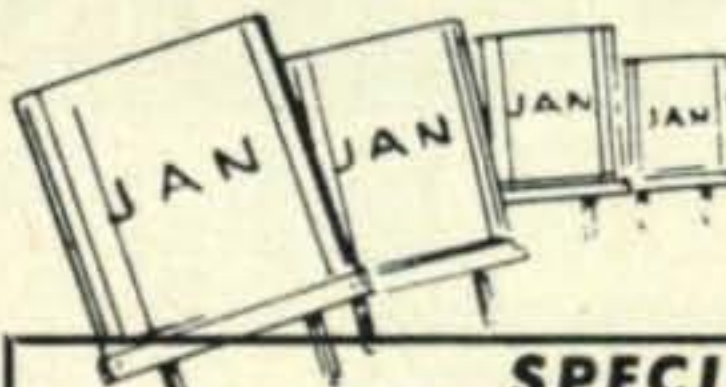
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The 30L-1 Linear Amplifier is priced at \$520, complete with antenna-line connector and interconnecting cables for use with Collins exciters. It is a product of Collins Radio Company, Cedar Rapids, Iowa. —W2AEF

Announcement [from page 16]

will be four stations operating on 2 meters. Certificates will be awarded to those contacting all four stations. The four stations are: W2ZDR/2, Washington Township, N.J., W2RRP/2, Sam's Point, N.Y., WA2ZAU/1, Topstone, Conn., and W2ERZ/3, High Knob, Pa. For further details contact: Frank Felice, K2EHR, 50 E. Clinton Ave., Bergenfield, N.J. 07261.

Tawas City, Michigan

The Tawas hamfest featuring a gigantic swap & shop, equipment displays, banquet, auction, and ham of the year awards will be presented by the Iosco Amateur Radio Club on Sept. 26th and miles north of Bay City. For additional information write: Ham-Fest, P.O. Box 3321, Jeff. Sta., Detroit, Michigan 48214.

Tampa, Florida

The Hillsborough Amateur Radio Society, Inc., Tampa Annual Hamfest will be held Sunday, Oct. 11th, in Lowry Park, Sligh Ave., and North Blvd., Tampa, Florida. Large sheltered Swap section. Plenty of free parking. Fun for the whole family.

Hamfest Directory

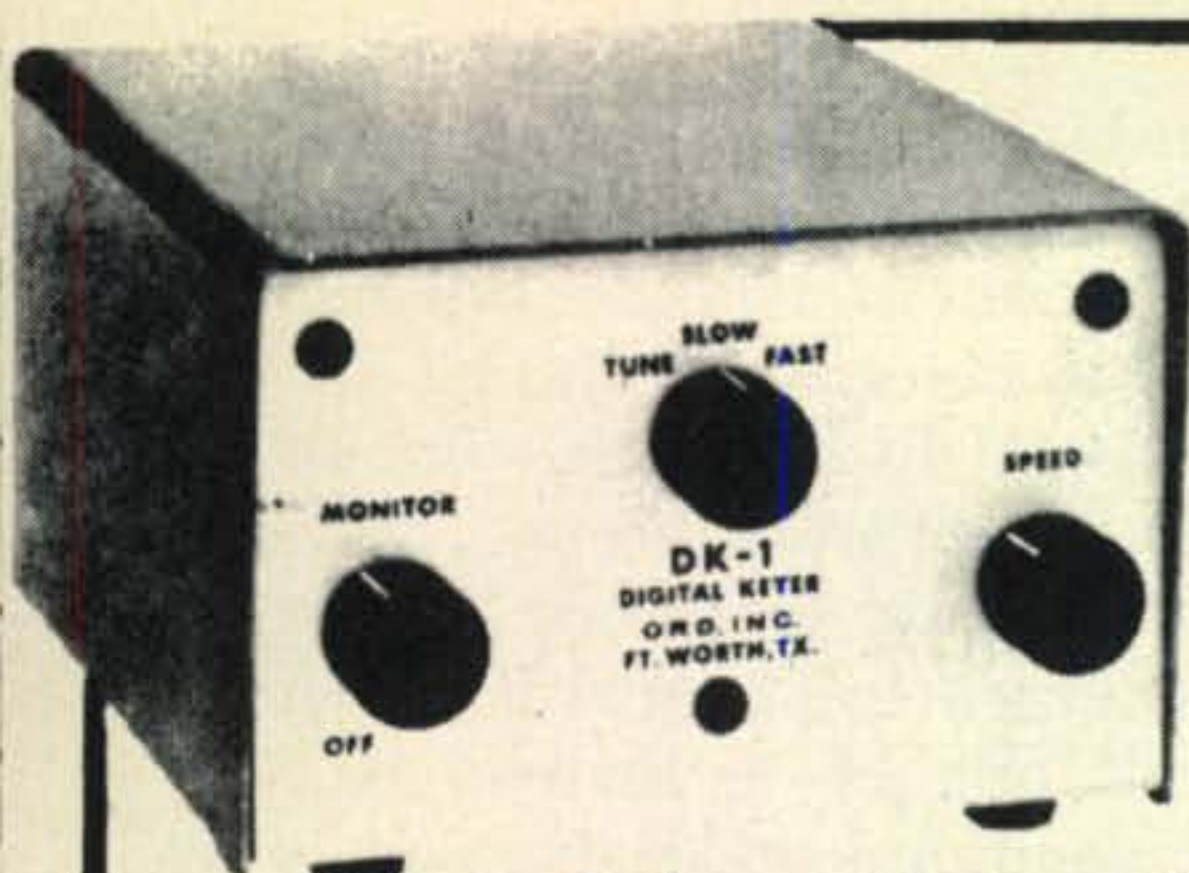
Art Collatz, K9JNZ, of 2127 Market St., Blue Island, Illinois 60406 is compiling information to publish a Hamfest Directory for 1971. Any club can have their event listed free by having an officer of the club send all information to him before Dec. 1.

160 Meter Reunion

The Chiburban Radio Mobileers will have their third annual 160 Meter Reunion, Sunday, Sept. 20th at the Joliet Beach Club, Joliet, Illinois. There is no charge and no formal activities planned. Discussion groups and slides. For additional information contact: Barry Mulvaney, WA9YDO, 13128 W. Playfield Drive, Crestwood, Illinois 60445.

Elusive TVI [from page 57]

seven homes and having no luck, we moved the car up the street a short way and started the same process again. At the third house Bill entered our problem came to a rapid head. The family that was watching a very fine-looking color set was asked to change channels and the instant this was done the picture and audio of the portable set in the



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"R"—Close dot-dash key. During the dash or second dot, release dash-dot key.

"P"—Close dot-dash key. During the second dash or dot, release dash-dot key.

"L"—Close dot key. During the first dot, flick the dash key. Release dot key during the last dot.

"B"—Close dash-dot key. Release dash key at any time during the three dots and dot key during the last dot; or, release dash-dot key during the last dot.

"Double Dash"—close dash-dot key. Release dot-dash key during the last dot or dash.

Note that in the above examples, only one depress-release cycle of the dot and dash keys is required. All letters, numbers and punctuation marks may be generated using variations of this technique.

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car cleared instantly. I gave the three blasts of the car horn and proceeded to drive the car directly in front of the house. Bill and the gentleman of the house came out to the car and the man asked to watch the picture on the portable in the car while his wife changed channels on their set in the house. When his color set was turned to channel 8 the interference came in our set on channel 10. The gentleman was amazed and expressed to us that it was hard for him to believe that *his* TV set was causing all the trouble he was seeing on the portable set in the car. He was very nice and cooperative in the whole thing and promised us that he would have a serviceman check the set at his earliest convenience.

The story does have a happy ending for all, proving that most people are good at heart. The serviceman notified the channel 10 folks that the problem had been located and the TV station manager told the serviceman to repair the set and send them the charges for parts and labor and they would be very happy to take care of it, which is unusual, to say the least. The TV station even asked for Bill's name and address for they wanted to send a letter thanking him for his efforts and interest taken in helping to find the answer to the problem.

When the serviceman examined and tested the problem TV set he found one of the oscillator coils in the tuner was out of place and was too close to one of the others and was picking up stray oscillations and somehow radiating them back through the antenna system. The adjustment was so simple that the serviceman donated his time and labor. No repair parts were used, so nobody was hurt financially and everyone ended up friends in the matter.

This article has been written in hope that it will be helpful to some other amateur who might possibly run across a similar problem of TVI. It seems rather far-fetched to believe that so many people were being bothered by a bad TVI problem for such a long period of time and doing nothing about it except talking about it. I suppose all of us are only human after all and just a bit afraid of becoming involved and possibly hurting a friend's feelings.

After enduring the problem all through the winter months of good TV watching, our neighborhood now has the assurance it will be able to enjoy a season of "re-runs" on channel 10 without a bad interference problem facing it! ■

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TOY TRAINS WANTED: I want to swap or buy those electric trains you no longer use. Any age or condition. Swap 75AZ, SX42, HP400D, G50, more. Send full description, asking price and SASE. K4EIH, Box 1028, Springfield, Va. 22151.

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FOR SALE OR SWAP: Laboratory Test Equipment; Garage full: Hewlett Packard UHF Signal Generators, \$25 ea; Oscilloscope-storage type, 5" screen- Similar to Tecktronix, \$250., etc. Stereo equipment- Cassette recorder/Playback units - Car and home types. Cameras, etc. Send for list. Murray, 11 Eldridge Street, E. Northport, N. Y. 11731.

WANTED: QST before 1920 and amateur radio-teletype publications. Orville Magoon, 1941 Oakdell Dr., Menlo Park, California. 94025.

NOVICE CRYSTALS: 40-15M, \$1.38; 80M, \$1.83. Free Flyer. Nat Stinnette Electronics, Umatilla, Florida. 32784.

160 METER MATCHVERTER resonates any 40 or 80 meter inverted vee/dipole on 160 meters. Handles 250 W PEP. \$29.95. Postpaid. TOP BAND SYSTEMS, Dept. 1, 5349 Abbeyfield, Long Beach, California. 90815.

Circuits for 32 electronic projects, R. F., audio & gadgetry, complete plans \$1.00. P. M. Electronics, Inc., Box 46204, Seattle, Wash., 98146. Dealer inquiries invited.

RTTY gear for sale. List issued monthly. 88 or 44 Mhy torroids, uncased, five for \$2.50 postpaid. Elliott Buchanan and Associates, Inc., 1067 Mandana Blvd., Oakland, Ca. 94610.

NOVICES: Will sell Heathkit DX-60 Trans. and HR-10B RECVR. Mike and Spkr. Each \$45., Both \$80. And Radio Shack Talkie, 5 watts C.B. \$45.00. Ivers, 39 Hickok Pl., Burlington, Vt. 05401. FOB.

FOR SALE: 75A4, excellent condition, \$360.00. Frank Frost, Route 1, Box 259, number 48, Eureka, California. 95501.

ELECTROLYTIC CAPACITOR 47-47 MFD 400 vDC. NEW 5/\$1.65, 10/\$2.50, 100/\$20.00. PLATE TRANSFORMER 1800 Vct 250 MA. 115/230 Primary. New 14 pounds. \$7.95. Please include postage. FREE CATALOG. R. W. Electronics, 4005 West Belmont, Chicago, Illinois. 60641.

SWAN 500C and 110 Volt P.S. Lafayette 6-meter Transceiver, \$75. Hallicrafter SR42A & VFO. Transceiver, \$125.00. - F.M. 2-meter FDFS-2S. 10 watts Varitronics Transceiver. 12 volt and 110 volt PS 200. Jos. Michaels, W2MNR, 80 Birch Lane, Woodmere, New York. 11598. (516) 295-3598.

SELL: AM, FM, FM MULTIPLEX RCVR, Record changer & TD-1025 Tape Deck, \$1.60. Speakers, \$20.00. SR-150 Xcvrs & PS, \$300.00. Knight T-60, & DX-150 Ham/SWL RCVR, \$120.00. 4-BTV, \$25.00 and Ten Meter 4EL Beam, \$10.00. Pick-up only! WA9WVJ, Gregory Young, 7527 So. Morgan, Chicago, Illinois. 60620. (312) VI6-0547.

BERKELEY 1 mHz counter, Mod 7160-101, 7 decades, with parts for 10 mHz conversion. \$250. Also 1556 counter and 1450 printer, \$150. SASE for info. W9TKR, 505 South Elmwood, Waukegan, Illinois. 60085.

POSTAL EMPLOYEES—Active and retired. National net opens Tue thru Sat 0200Z7097 kHz. For info contact W8QCU, Philip Brust, Nat'l POD Mgr., c/o Postmaster, Springfield, Oh. 45501.

SELL—TRADE: QST 65-69, CQ 68-69, Bendix BC 221-M Freq Meter. WANT: HW-16, receiver, or offers. A. M. Fox, Box 895, Greeley, Colorado. 80631.

FOR SALE: Cabinet Racks with doors over 6 feet of 19" (inch) panel space. Good condition. No shipping. \$30.00 each. W4JSC, Rt. 2, Box 952, Odessa, Florida. 33556. Phone 813-920-5094.

SELL: Collins Noise Blanker for KWM-2 \$85; PM-2 AC Supply, \$90; Wagner Xfmr 3600-0-3600 at 1 amp with 110/220 pri. \$30.00. All FOB. Rev. Bittner, W0AIH, 814 4th St S, Virginia, Mn. 55792.

WANTED: Marconi MSL-5 or similar long wave rcvr 15 kc to BCB. State condition and price. W4UPE, 3127 Oriole Drive, Louisville, Ky. 40213.

HEATH SB101 — 8 months old & P. S. Excellent with manuals, \$400.00. WB4DYN, 17401 N. W. 19 Avenue, Miami, Fla. 33054.

SALE OR SWAP: NAVY HRO RECEIVER. Rack mounted. Coils 190KH-30MH. Washington, D. C., only. K4ASJ, 780-3762.

SELL OR TRADE: Home brew 75MTR SSB Transceiver with PS, \$75.00. W4WFB, Roy, 2214 Beverly Drive, Charlotte, N. C. 28207.

FOR SALE: 20413A Hi-Gain Mono Band 4 El. Beam. Never uncrated. \$100.00 FOB. I. W. Boden, Box 543, Paris, Tenn. 38242.

SELL: Heathkit SB-301 like new. \$210.00 plus shipping. L. Van Heuveln, WA0NUX, Box 622, Salem, South Dakota. 57058.

FOR SALE CQ Magazines 1945 to 1967, QST 1937 to date 4 copies, \$2.00. Prepaid. Send SASE for list. W0BK, Arthur Jablonsky, 1022 N. Rockhill Rd., St. Louis, Mo. 63119.

FOR SALE: National 60 Receiver. Good working order, and performs well on ham bands, \$28.00. Will ship, my charge. Tom Noel, WN3OKJ, 132 Ponderosa Drive, Beaver Falls, Pennsylvania. 15010.

SELL: Mod. 15 Teletype w/mag. pwr. sup., pl. rly., table., and TU. Ex. Cond. \$50.00. K8AGO, 15030 Bradner Road, Plymouth, Mi. 48170.

FOR SALE: Johnson SSB adapter, \$125.00; Johnson 6N2 Converter, \$39.00; EV926 crystal mike, \$12.00. W8IIT, 281 Jenny Ln., Dayton, Oh. 45459.

He45B, \$50.00, Twoer with 12 VDC \$50.00; Viking II, \$75.00; WA5CMC, 2309 Bullington, Wichita Falls, Texas. 76301.

WANTED TO TRADE: Hallicrafters SR-400 or SR-2000 w/power sup & separate VFO for my HT-46 & SX-146. Top condition! Vern Weiss, c/o WKAK, Kankakee, Illinois. 60901.

ATTENTION OLD GEAR COLLECTORS...Copies Greenwood's Pictorial Album Wireless & Radio, 1905-1928 available; \$3.00 PPD. WA4NED, Box 468, Gainesville, Ga. 30501.

SELL: Heathkit HW-16 CW Transceiver — New, \$70 or best offer. WN9CQA, 2015 Silver Court, E., Urbana, Illinois. 61801.

FOR SALE: Swan Cygnet 270 Transceiver with complete five band Hustler Antenna System and mobile antenna mount. \$500. K9TSY, 2916 North Oakwood, McHenry, Illinois. 60050.

COLLINS S-Line, mint condition, 75S-1 Serial 1278, 32S-1 Serial 1292, 516F2 Serial 10039, Console 312B4 Serial 544, \$655. HW-12A and 110 V.A.C. Pwr Supply, \$65. Will ship postpaid for first certified check or money order. K5UAI, Eddie Miller, 3124 Amarillo, Baton Rouge, Louisiana. 70805. Phone: (504) 355-7943.

\$220.00 Takes TWO HRO5 receivers with four coils ABCD, both have separate power supplies and speakers including manual Or swap for SB200 plus ant. relay. Guz, WB2Ezu, 585 Chapman Pkwy., Hamburg, New York. 14075.

SELL: CRT's - Assorted types, most new: 5CP7A, 5ADP2, 3JP2, etc. Write for List. R. Mendelson, W2OKO, 27 Somerset Place, Murray Hill, New Jersey. 07974.

40 METER BEAM: 2 Element, Hy-Gain 402BA Good condition. \$85.00. John Stransky, 1142 Flintlock Road, Diamond Road, California. 91775. Telephone: (714) 595-0224.

SELL: HW-100, HP-13A, HP-23A, and SB-620. Mint. 10% below Kit price. W4YWA, 597 Capri, Cocoa Beach, Florida. 32931. (905) 783-7074.

WANTED: Kits to build 12% of cost. **SELL:** 260 watt 80-10 Power Amp. Kirby, 11 Berkshire Ct., Huntington Station, L. I., N. Y. 11746. WA2DZG.

SELL: NCX-3 w/H.B. PS very good condition, recently aligned, \$150.00. Dick Freitag, Treetop Rd. White House Station, N. J. 08889. (201) 439-2615.

FOR SALE: NC-183D, \$110.00; Lysco 500's, \$25; Globe Scout, \$20.00. K8EKG, Joe Turkal, 1020 4th St., SW, Massillon, Ohio. 44646.

FM, 2-Meter GE Progress Line 60-Watt Base Station. Four Channel with Xtals. Very good cond. \$250.00 FOB. WA5WGO, 4911 Western, New Orleans, La. 70122.

WANT TO BUY OR RENT to make Copy Schematic and/or Instruction Manual for Model 100 Superoter Antenna Rotator. A. M. Gus Goings WA-4CPL, Box 1195, Tavares, Fla. 32778.

WANTED: Schematic and technical data on TOBE Amateur Communication Receiver Model H, with Tobe 35 Tuner, ca. 1936. K8IKO, Box 22, Worthington, Ohio. 43085.

DRAKE 2-C, Calib., noise blanker, 2CQ Spkr. 2 yrs. old, \$195 FOB. K8IKB, 15378 Sand Ridge Rd., Bowling Green, Ohio. 43402.

FOR SALE: Single and two 4-1000A—York Transmitters. Bill Brown, W0SYK, 28 Marine Ave., Hazelwood, Mo. 63042.

SELL—SWAP: Swan 250, Swan 350C, Collins DC Power Supply, Mobile Mount. **WANTED:** Collins 312B-5, PM-2, CC-2. WA3HMQ, P. S. Abbott, 801 Blacksmith Rd., Camphill, Pa. 17011. 717-761-1107

SWAN 500C used approx. 50 hrs., it's still bright and shiney. Have gone all Heath. Will ship in original carton for \$345.00. First check gets it. All others will be returned. F. Colella, 105 18 131 St., Richmond Hill, L. I., N. Y. AC 212-641-2559.

WANTED: Schematics or plans of any metal 'Treasure' Detectors or Magnetometers. J. Wegner, POB 262, Glendale, California. 91209.

WANTED: Back issues of all 'Treasure' Magazines, Reasonable. Joe Wegner, Jr., POB 262, Glendale, California. 91209.

SELL: RME6900, \$150.00; B & W 51SB Gen-Mint, \$75.00 w/books, J. E. Peirson, WA3ASQ, 105 Midway Dr., Phoenixville, Pa. 19460 or Call (215) 933-6024 after 6:30 P. M.

SELL: 30 AMP filament chokes, bifilar wound on 1/2" x 7 1/2" ferrite core, 3-30 Mc. \$5.00 ea., Postpaid USA. vonn R. Murrell, K4HHA, 712 Rich Road, Newport, Tenn. 37821.

FOR SALE: Factory-sealed: 30L-1, \$445; 312B-4, \$175; 516F-2, \$135. 32S3, 516F-2, 75S3 (6EH7 RF), 312B4, \$1000. 399G-1, \$165. Hy-Gain LP-1007 Log Periodic (13-30 mcs, 5KW), \$250. Telrex A1312RIS rotator, console, 100 Telrex control cable, \$250. Cubex 4-el tri-band quad, \$125. James W. Craig, 29 Sherburne Ave., Portsmouth, New Hampshire. 03801.

28 KSR and 28 ASR floor model cabinets in good used condition for sale or trade. D. C. Harrington, K0SHK, 1620 Gardenia Avenue, Fridley, Minnesota. 55421.

KW LINEAR AMPLIFIER FOR SALE: Heath Model HA-10 in excellent condition. So. Calif. only. \$140. A. Emerald, 8956 Swallow Avenue, Fountain Valley, California. 92708.

FOR SALE: Complete Hallicrafters Station for transceive or separate operation. HT-44 and SX-117. All cables, relay, mike, and power supply. Like new. Shipped in original cartons. A-1 condition, \$400.00. K5LGD, Robert L. Owens.

FOR SALE: Swan 350 C, 14-117 ac-dc supply, \$395. DX20 - \$25.00; DX-35, \$35.00; Galaxy III and ac supply (needs a little work). \$150; looking for a 2-meter FM station. WA8TER, Paul Gates, Box 7197, Flint, Michigan. 48507.

F.M. TRANSCEIVER, I.C.E. solid state on 146.34, .76, & .94 MC; like new, \$150. Termliner wattmeter for \$75. W. J. Davis, 4434 Josie Ave., Lakewood, California. 90713.

FOR SALE: NRI Radio-TV course, W/VTVM, \$75; Sams Photofacts, 420 pcs, covering nos. 1-620, \$150.00; Kodak Verifax mdl. E Copier, W/ACC, \$35.00, EICO 944 Yoke and Fly Tester, \$22.50; All FOB. R. Wendel, WB2YYX, 160-20 Grand Central Parkway, Jamaica, New York. 11432.

FOR SALE: 2 - General Electric Transmitter-REceivers, model 4ESI4A1, 449.4 mc. 1-117 VAC to 12 VAC 60 amp. Power supply. Eugene F. Balcom, K9COS, 1201 So. Irvington Avenue, Indianapolis, Indiana. 46203.

APACHE XMTR FOR SALE: Novice or general, phone or cw, xtal or VFO, only \$70. Will ship. Eugene Gascho, RR 2, Pigeon, Mich. 48755.

MUST SELL: TR-108, ARC-5, 7-9.1 MC vfo, 7 elm beam crystals, halo, rotator. Any or all. Make offer. All letters and cards answered. WB2YRM, 134 Concord Road, Yonkers, N. Y. 10710. Phone: (914) - 337-2266.

FOR SALE: HRO 5 with coils A, B, C, D, E, F, G, H, J, JA plus speaker, power supply and instruction book. Excellent operating condition. Will sell receiver and A, B, C, D coils, \$125 or \$200 for receiver and all coils. Atwater Kent AK20, excellent operating condition with Morning Glory speaker, \$100. 1920 vintage 394W double button mike with case, \$75. Two shadow boxes, 16 x 20 each, one with 1920 parts and the other over 200 transistors and integrated circuits. Make a fine shack exhibit and historical exhibit - make offer. Wells Chapin, W8GI, 2775 Seminole Rd., Ann Arbor, Michigan. 48104.

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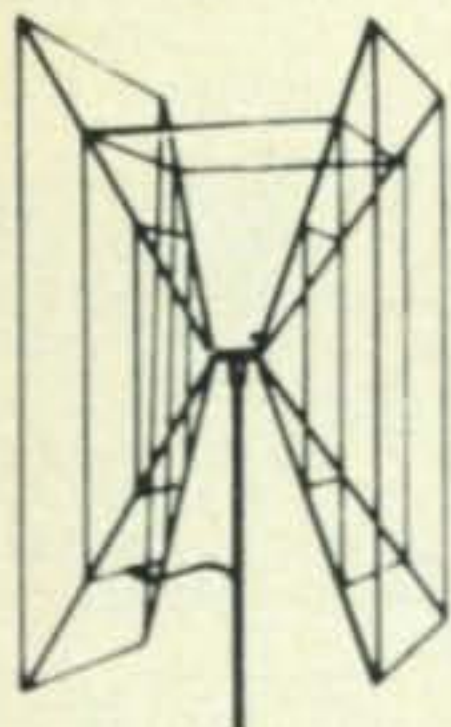
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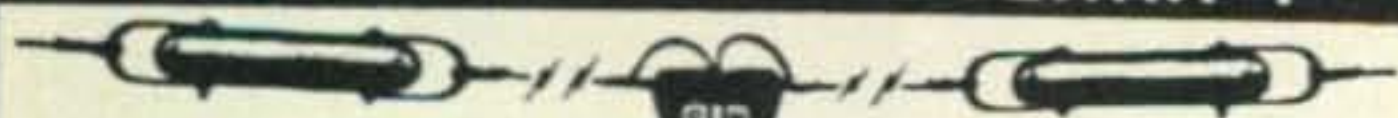
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VIKING II, 160-10M, 200w, \$65. 4-65A w/socket, \$4.00. 50' RG-9, \$15. Heath Sixer, never used, \$30. WA2FFZ, 186 West Avenue, Pitman, N. J.

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MOSLEY TA-32 Jr. and CDR TR-2C Rotor. Package, \$60.00. WA9YNE, 17 West 151 White Pine, Bensenville, (near Chicago), Illinois. 60106.

28 ASR and KSR Floor Console Cabinets for sale or trade. D. C. Harrington, 1620 Gardenia Avenue NE, Minneapolis, Minnesota. 55421.

HEATHKIT HR-10B RCVR, HRA-10-1 Xtal Cal., DX60B Xmtr, HG-10 VFO, and a few novice xtals. All fb condx for \$160. WB9CJH, 3649 Sayre, Chicago, Illinois. 60634.

GLOBE CHIEF 90 transmitter and external screen modulator for \$25. Eico low capacity probe for \$3. WA1JQA, Joe Olesik, Concord Terrace, Somers, Connecticut. 06071.

FOR SALE: '41 and '42 ARRL Hand books - Bids. One 2-inch thick hard cover manual for Radio Set Ser. 268C, \$5, F.O.B. Douglas, 2254 Pepper Dr., Concord, California. 94520.

88 mh Torroids, uncased, 5/\$1.50, Polar Relay Socket, 75 cents. PP 48, E. W. Evans, 220 Mimosa Lane, Paducah, Ky. 42001.

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WANT: Johnson Ranger for parts. W5HHJ, Rt. 6, Box 436, Oklahoma City, Okla. 73119.

FOR SALE: SX71 receiver and HT 40 transmitter for \$80.00. Jeff Dembowski, 7023 Magoun, Hammond, Ind.

FOR SALE: 62S-1, \$495. 500-C, 117-XC, \$435. 75S-1, 32S-1, 516F-2, 312B-4, \$700. Galaxy 300, PSA-300, \$185. HW-32-A, HP-23-A, \$135. 30L-1, \$300. HRO-50, spkr, ABCD coils, \$150. Squires-Sanders SS-1 R, SS-1S, spkr, \$325. James W. Craig W1FBG, 29 Sherburne Avenue, Portsmouth, New Hampshire. 03801. (603) 436-9062.

RTTY INFORMATION for the Amateur interested in RTTY. F. DeMotte, P. O. Box 6047, Daytona Beach, Florida. 32022.

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WANT: Heath SB 10 SSB adapter, must have manual and cables. W. C. Holder, 1000 West Alden Avenue, Valdosta, Georgia. 31601.

OLD "DODGE" GRADS: Join VALPO Tech. Alumni Assn. Valparaiso, Ind. 46383. DE W3MSN.

WANTED: Good electronic keyer with self-completing characters, and paddle. Will buy or trade if reasonable. WN4OVR, Star Route, Northport, Alabama. 35476.

SAROC, Flamingo Hotel Convention Center, Las Vegas, Nevada, January 7-10, 1971. Watch for classified and display SAROC advertising.

WANTED TO BUY: Vox for Swan 350C and Vertical Antenna. Both must be in good condition. For sale 14-117 Swan 12 volt Power Supply for \$75.00 in good condition. R. Dorough, 117 Pecan Street, Terrell, Tx. 75160. W5DPN.

FOR SALE: Twenty Meters!!! Yeh, that's right-TWENTY METERS FOR SALE!!! Only \$62.50 CASH. 10 and/or 15 meters for best offer. J. Brink, POB 3734, Fayetteville, North Carolina. 28305.

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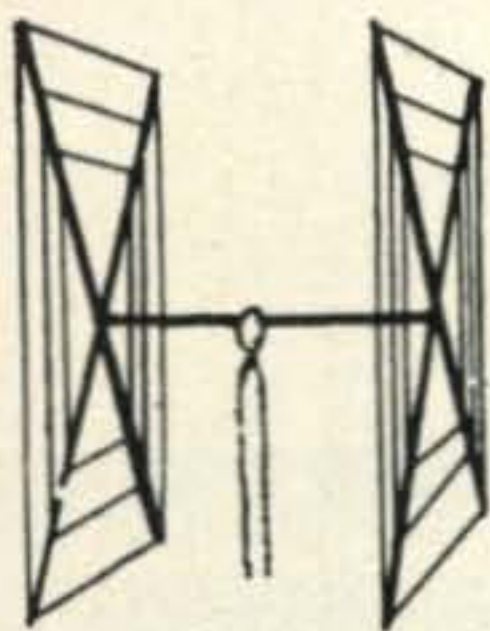
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Freq. Covered: 14-14.4 Mc. 21-21.45 Mc. 28-29.7 Mc.

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Dimensions: About 16' square.

Power Rating: 5 KW.

Operation Mode: All

SWR: 1.05:1 at resonance

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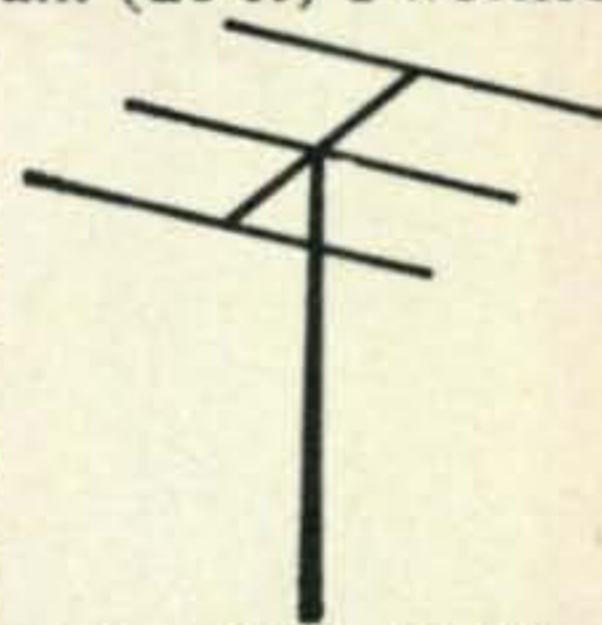
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